

February

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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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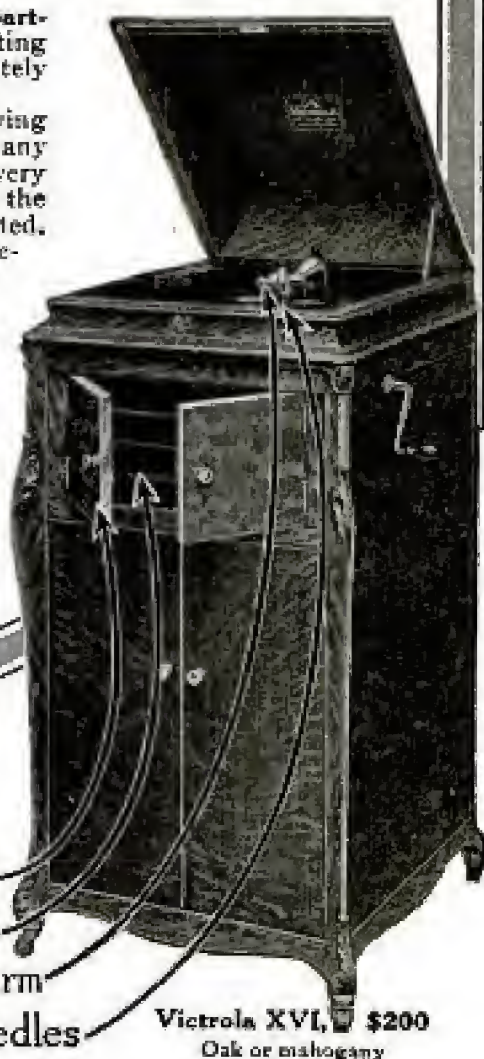
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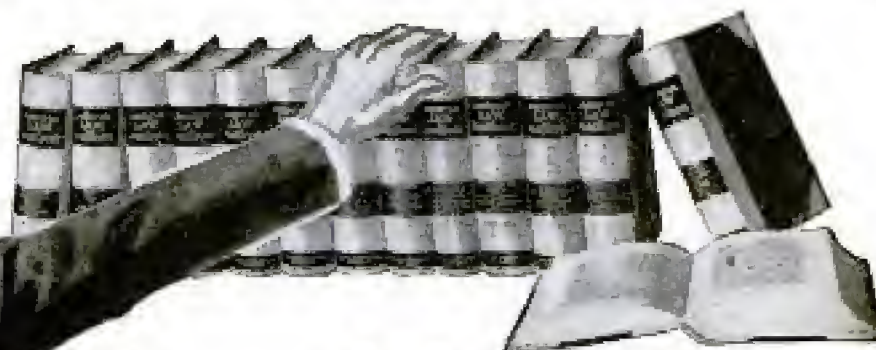
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Harry J. Herbin, Janeltown, Kan., was a farmer, but has decided his income repairing and selling autos.

Mr. O. Strickland, Westport, Ont., Canada, writes us: "I am glad I took your course. Have just overhauled a car; timed the valves and set the magneto. Don't save, realize how much power. This is my first job. Thanks to your course."

Harold Stewart, Oakland City, Ind., became a chauffeur at \$25 a week.

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And we could continue until we had filled this and several more pages.



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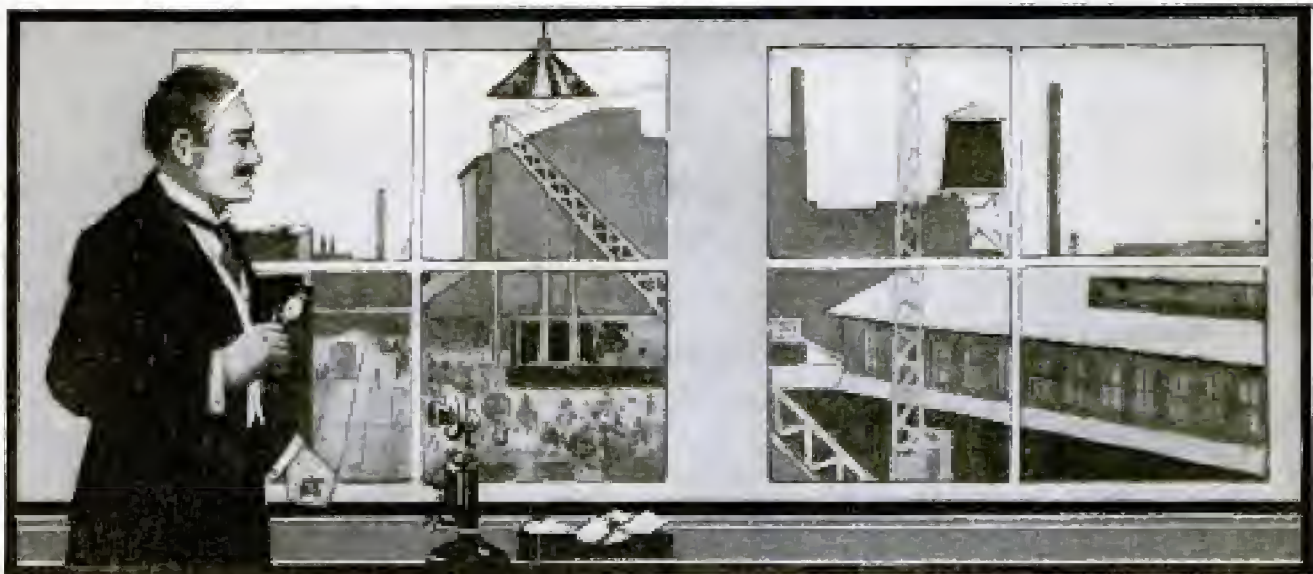
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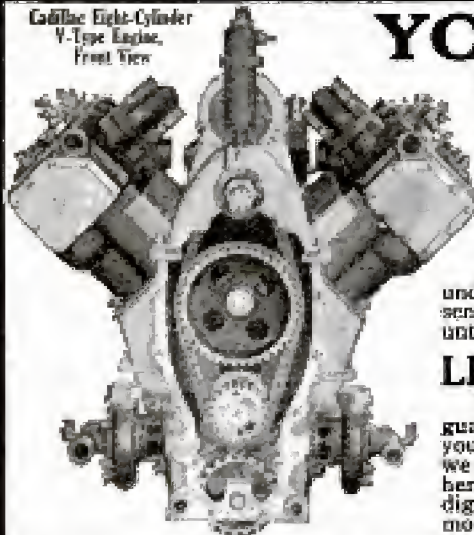
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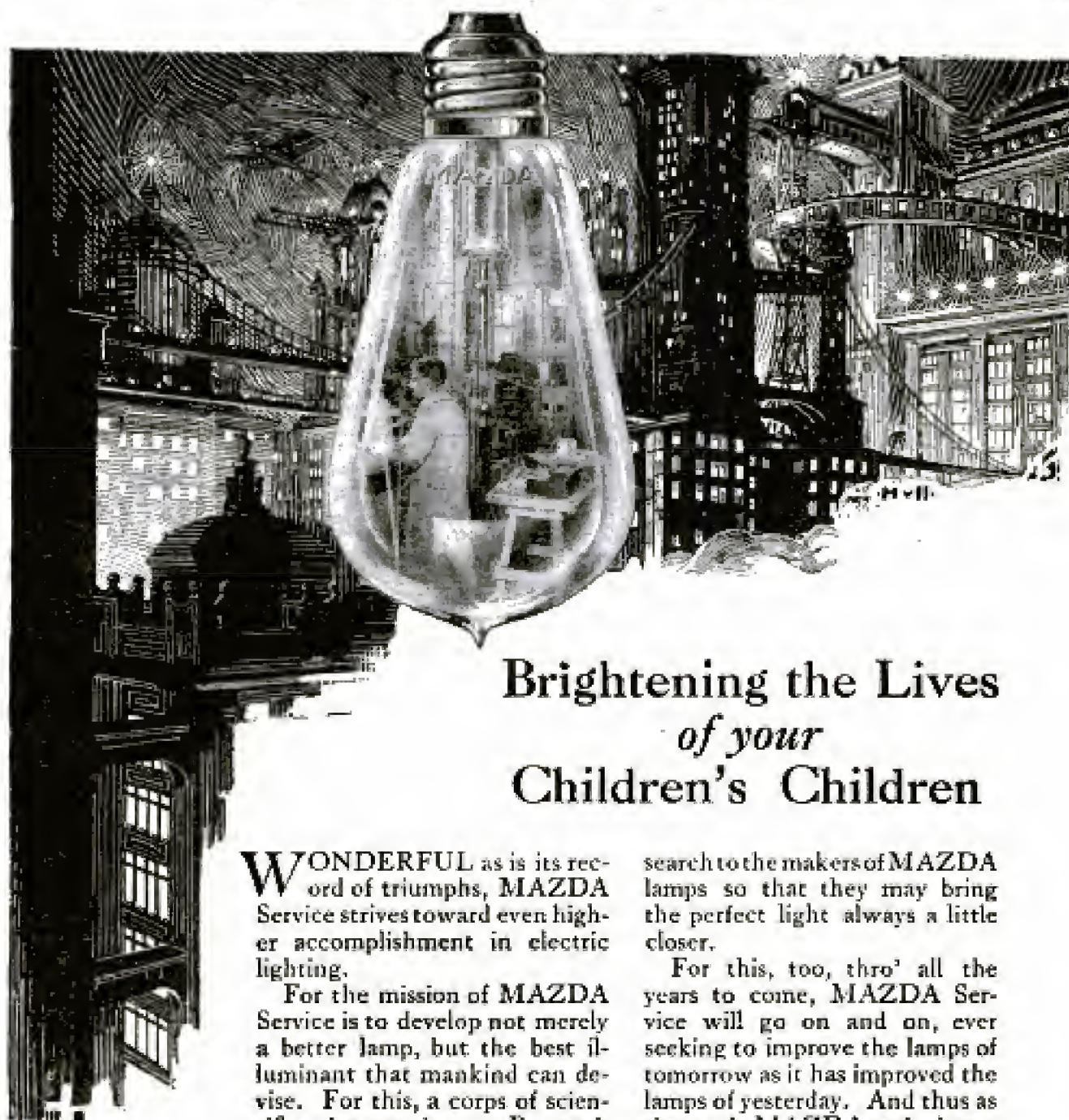
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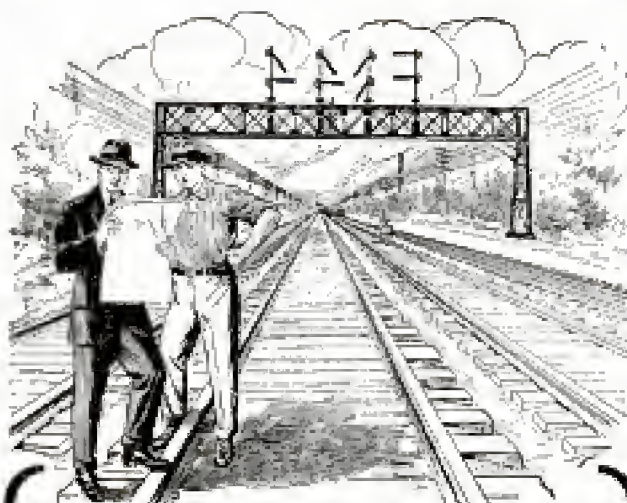
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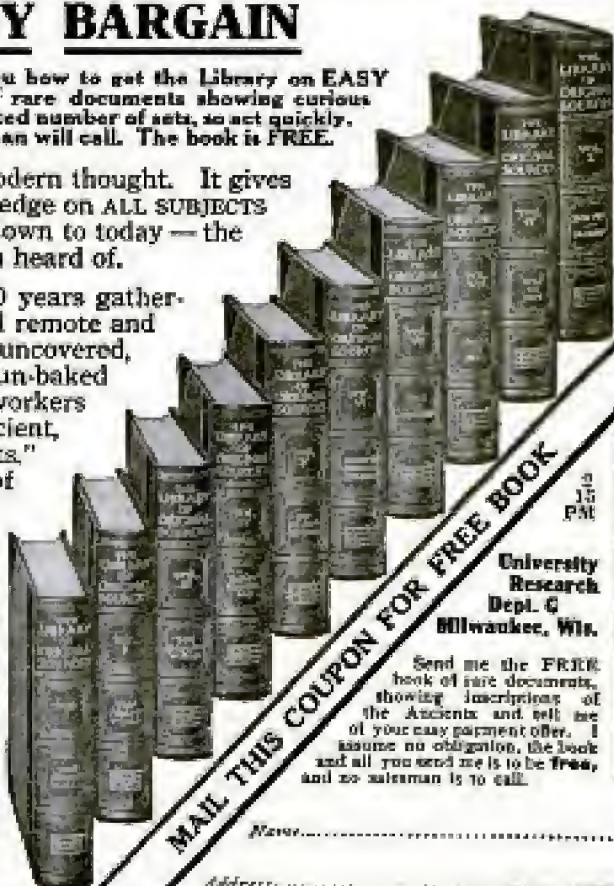
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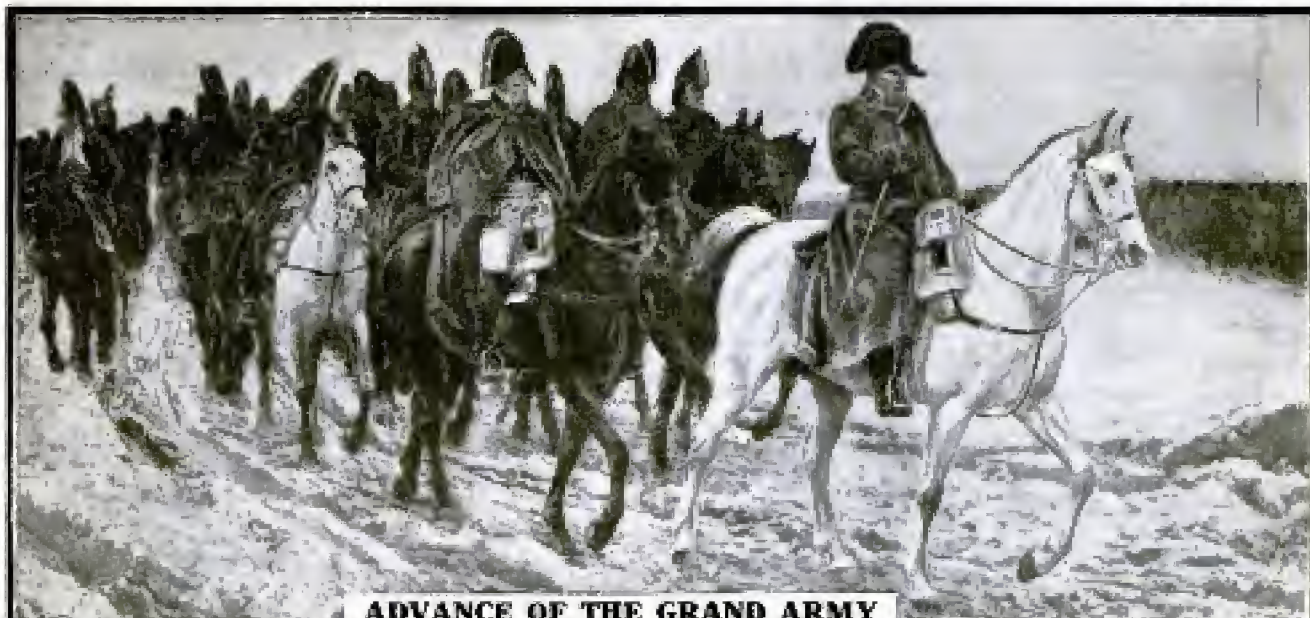
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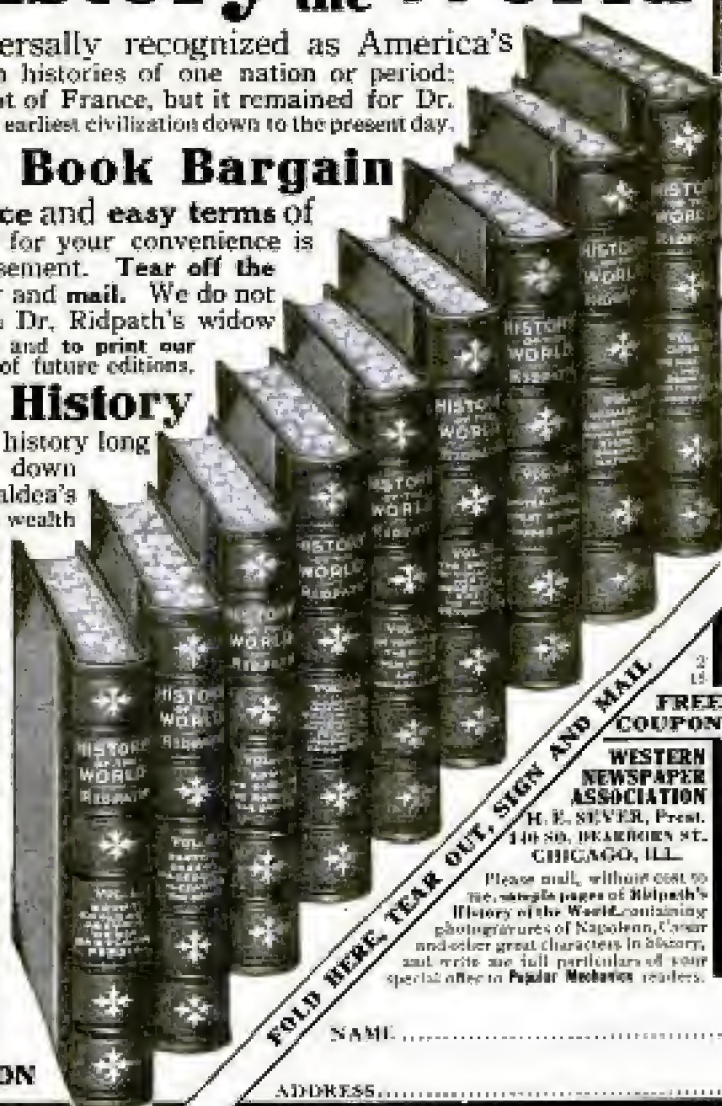
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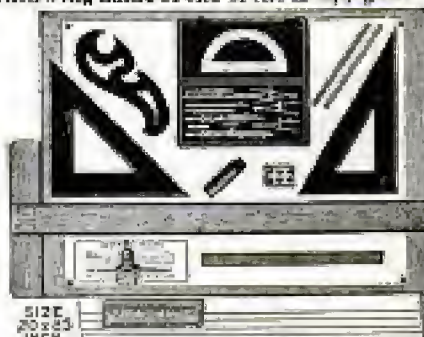
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BE Wise. Don't experiment in mail order. I can tell you how to succeed. **E. Neuhann**, Waukegan, Ill.

300 WAYS to make money. 220 page book of valuable information. 25c (no stamps). Wm. D. Black, 72 Spruce St., S. Manchester, Conn.

SILVERING mirrors; 150 other money-making formulas; Digest one year, 25c. Digest, Grand Rapids, Mich.

50-PAGE mail-order advertising rate book—4c exact sealed postage. **Kline Advertising Agency**, Cleveland, Ohio.

START a Light Manufacturing business at home in spare time. Big profits. 150 money-makers 10c. **Service Bureau**, 3211-B, Bellvue Ave., Chicago.

FOURTEEN Big Circulars describing 300 plans, schemes—for making money—guaranteed Formula for restoring Old Dry Batteries (original price \$1.00), all for 10c. **Northern**, 154 West Randolph, Chicago.

WATCH and Jewelry catalog, illustrated, 16 pages, with your imprint; 500 for \$5. **Walton Co.**, 150 Nassau St., New York.

A BRILLIANT opportunity awaits you. Manufacture a household necessity in your own home, and make \$3.50 profit on each dollar invested. **New England Sales Co.**, Stamford, Conn.

WE will start you in business cleaning either houses or clothing; small capital required; good income earned in terms of 2,000 and over. We manufacture electric and gasoline driven vacuum cleaners. Write today. **Thurman Vacuum Cleaner Co.**, Dept. H, St. Louis, U. S. A.

RESILVERING mirrors, renewing dry batteries and book filled with formulas and trade secrets, all 25c. **Formula Service**, 3211-B, Bellvue Ave., Chicago.

TWELVE years ago I started a small mail-order business at home in spare time with a few dollars capital. I wanted to make \$30 or \$40 a month, evenings. The net profits the first year averaged \$200 a week. Five years' work netted me \$55,000. I will show you how to start a small mail-order business. Send today for my proposition. It's interesting. No canvassing. **Hazenck**, Box 887, Lockport, N. Y.

EARN \$7 daily, restoring faded colors in rugs and carpets. No capital. Particulars free. **Edred**, D. 15, Detroit, Mich.

UTILIZE your spare time. Start a small mail-order business at home. Become your own boss. I'll show you how without advance payment. You pay my fee from profits. No success, no fee. Particulars free. Postage appreciated. **Expert**, 420 Home Bank, Baltimore, Md.

"DOLLARS" yearly in your back yard. No cloning, mushroom dope. New ideas never before published. Particulars free. **Mex**, 308 East 88th St., New York.

MANUFACTURERS, Promoters and Patent Buyers are invited to write us stating the line of invention in which they are interested, as we can supply their wants in any class of patents. **Victor J. Evans & Co.**, 162 Ninth St., Washington, D. C.

MANUFACTURE Typewriter and Other Inked Ribbons. Demand enormous. You can lease the wonderful Hilde machine from us—we furnish material, teach you everything—also act as district manager, leading machines to big consumers—small capital. Sample ribbon any machine. 25c in stamps. **National Ribbon Inking Machine Co.**, General Office, Tenth Floor, City Hall Square Bldg., Chicago.

WOULD You Like to Own a good-paying mail-order business? We have a line that gets repeat orders all the time. You can start in spare time; invest a dollar or two a week and soon own a nice business of your own. Particulars free. **Nadico**, 1664 Belmont Ave., Chicago, Ill.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 15 years' practical experience. Revision and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. **Rock-let**, Formula 134, and Valuable Information Free. **W. L. Cummings**, Ph. D., 127 Standard St., Syracuse, N. Y.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. **Voorhies**, Desk C. R., Omaha, Neb.

HOW to Operate a Mail Order Business. 50 Big Profit Plans and year's Mailing service sent for 10c. **Mail Dealers Wholesale House**, 521 Franklin Bldg., Chicago.

START a Mirror Factory! We teach thorough methods! Trust your 10c brings illustrated lesson! Prospectus 45 daily, easily! **Hullinger's Institute**, Francesville, Ind.

ADVERTISEMENTS, Mail Dealers: Our 1015 Rate Book lists 2,000 Principal Publications, rates, circulation. Includes 30 Mail-Order Plans. Price 10c. **Dearborn Advertising Agency**, 218 Franklin Bldg., Chicago.

LEARN New Tarnish Mirror-Silvering Process—It Pays! Address **Wm. Burston**, 523 Bird Street, Oakland, Calif.

THIS beats Illinois. Charters for stock companies lower than other states. Information free. **Philip Lawrence**, former assistant secretary of state, Huron, S. D., 101 Dakota Ave.

HOW to originate a successful mail order business. Particulars free. **George Fenner**, Louisville, Ky.

VALUABLE to M. O. Dealers, Agents—Herb Doctor Herbs Book and herb catalogue, 10c. worth dollars. Teaches how to make herb medicines for all diseases. Ind. Herb Gardens, Dept. 44, Hammond, Indiana.

I GET 30 to 40 letters a day, each containing a dime. You can do the same. Particulars 10c. **Horas Perry**, Oklahoma.

START a Stock Food Co. Be Independent. We tell you how. **Leslie Cole Stock Food Chemists**, Ewing, Mo.

PATENTABLE ideas wanted—Send for 3 free books. **R. B. Owen**, 29 Owen Bldg., Wash., D. C.

BUSINESS wanted for cash buyers. Send description and price. **John H. Wright**, Real Estate Expert, 1308 Adams Express Building, Chicago. Established 1881.

If you want facts instead of fables about Patents, address **Benjamin & Basgett**, 140 S. Dearborn St., Chicago.

40 into the cleaning, dyeing and pressing business. Big profits. Complete course only \$2. **Kay Ellis**, Menominee, Mich.

REPAIR our own \$5 to \$10 weekly in your spare time mailing circulars for responsible concerns. Detailed instructions, 12c. **Wilks Mailing Bureau**, Box 6411-G, Philadelphia.

WANTED—Men in every locality to open a Cleaning, Dyeing and Pressing Shop. Big profits. No experience or capital required. **A. Lamm Specialty Co.**, Alliance, Ohio.

MAKE more money. How? Collect more money. Form 10 will do it. Write us. **Associated Mercantile Representatives**, St. Louis.

A BUSINESS of Your Own—\$10.00 daily profit. Make Koko-Wheat-Crisp. New perfection. 5c package costs 1 1/2c. Sold everywhere. Repeater. Can of samples 10c. Free particulars. **Cocorus Co.**, 541 No. Parkside, Chicago.

LEARN to collect money. Good income; quick results. Send for free booklet, "Skillful Collecting." **Collectors' Association**, Long Street, Newark, Ohio.

"MYSTERIES of Money" Dime. C. C. White, Haverhill, Mass.

OPERATE profitable mail order business. Instructive literature free. **Autrey**, 327-PM, Cuthbert, Ga.

START Profitable Mail Order Book Business. Further information and sample catalogues sent for stamp. **Sheridan Co.**, 417 E. 151st St., New York.

I WANT to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. **F. W. Johnson**, Classified Dept., Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

OWN a business. Co-operate with me evenings at home. Everything furnished. Don't worry about capital. **Boyd H. Brown**, Dept. K-2, Omaha, Neb.

WRITE Moving Picture Plays. \$50 each. All or spare time. Correspondence course unnecessary. Details free. **Atlas Publishing Co.**, 3014 Cincinnati, Ohio.

WE start you in business, furnishing everything; men and women, \$30.00 to \$200.00 weekly operating our "New System Specialty Candy Factories," home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. **W. Hagedale Co.**, East Orange, N. J.

NEW way to paint signs. Our life-size patterns do the work. No experience required. Complete outfit prepaid, \$5. Satisfaction guaranteed. **Bath Advertising Co.**, 15 W. 14th St., Kansas City, Mo.

YOUR advertisements placed in 100 different magazines; special price 5c per word. Lines free. **King's Magazine**, Box 1870, Little Silver, New Jersey.

FEW valuable, practical patents for sale; reasonable; fine chance. **Saunders**, 114 W. Van Buren St., Chicago.

DANDY home business. Comfortable living awaits anyone who investigates. Particulars free. Write **President**, 407 Park Pl., Baltimore.

"THE Art and Process of Dry Cleaning." A very profitable business. Send for our booklet. **McC. Auburn Supply Co.**, Dept. 12, 1745 Peoria St., Chicago.

CONDUCT a "Candy Kitchen." Clear \$1 to \$25 daily. Small capital required. Particulars free. **The Kennen School**, 148 W. Ontario St., Dept. A, Chicago.

FORMULAS and instructions for manufacturing six big sellers, and 100 business opportunities. Sent for 10c. **H. B. Essex**, Box 476, Baltimore, Md.

UNLIMITED Possibilities in Specialty Candy Manufacturing anywhere. We teach by correspondence, furnishing everything to start. Low prices. Literature free. **Gerdip**, 1204 Broadway, New York.

ADVERTISE—21 works in 50 family weeklies. \$1. **Cape Agency**, St. Louis.

GINSENG Building—Most profitable business in the world. Address **Thomas C. Davis**, Room 18, Wright & Bogart Bldg., Clinton, Ind.

PROFIT-Sharing Mail-Order Plan; absolutely new. Goods, literature furnished. **Delyle Distributing Co.**, Station B, Baltimore, Md.

INVENTOR'S Advocate, Washington, D. C. Best inventor's paper. One year on trial, 10c.

EARN more! Be more! Success literature and advice-letter free; will open your eyes to many new possibilities. Write today. **East School**, D-21, St. Louis.

WE will start you in the cleaning and dyeing business; little capital needed, excellent profits. Write for booklet, **Rem-Yendo System**, Dept. C, Charlotte, N. C.

PROFITS from foreign patents; offering quarter share for costs. Long-felt need effectively provided. **Hascall**, 578 Public, Providence, R. I.

BIG money-making opportunity. See page 105, advertising section.

WE can start you in a profitable business making big money placing Premium Punch Board Deals. Devote all or spare time. Small investment required. **Washington Sales Co.**, Dept. C, Chicago.

\$5.00 PER day, spare time, small mail-order business; I do it, so can you. Complete plan and sample 25c. Satisfaction guaranteed. **W. P. King**, Little Silver, New Jersey.

WANTED—Names and addresses by mail-order houses; big pay; home work; information free. **Direct Appeal Co.**, Dedmar A, Plymouth, Ind.

RESILVER Mirrors and make money. Others are doing it. The best formula 25c. **Auburn Supply Co.**, Dept. B2, 1745 Peoria St., Chicago.

START a Manufacturing Business.—Make and sell your own preparations. No experience required. Big income. Our practical formulas do the work. 60 money-makers, 25c. Formula Service, 2311-B, Halaplane Ave., Chicago.

WE have several openings for establishment of independent mail-order business. Energy, good habits and sound judgment more important than capital. Spare time at first. Particulars free. Opportunities Exchange, Buffalo, N. Y.

MAIL ORDER SUPPLIES

SG&A Joker's Novelties 15 samples 10c. Chambers Works, Plainwell, Mich.

INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine." 30,000 copies guaranteed every month. Classified rate 2c per word. Mail in a trial ad today. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago.

SCHEMIE and particulars 10c. Star Exchange, Elm College, N. C.

PAN-AMERICAN INVESTMENTS. A. B. C. REPUBLICS, SOUTH AMERICA

CAPITALISTS desiring to investigate with the view to investing in Coal, Iron, Petroleum, Nitrates or Borax deposits, etc.; Mining Properties (Copper, Tin, Silver, Gold, etc.); Real Estate (large land tracts, Governments or private, all forest, grazing or agricultural), located in the "A.M." and adjoining South American Republics, are invited to write for information, enclosing 20c in stamps, to Y. Demola Locking (Pan-American Real Estate Dealer), P. O. Box 1801, Santiago, Chile.

TO INDUSTRIAL ENTERPRISES, MANUFACTURERS, ETC.

GOVERNMENTAL and Municipal Franchises solicited in the "A.M." and adjoining South American Republics, water powers, etc.; bids presented for execution of public works, supplying materials, etc.; legal and commercial representation of manufacturers, reports on establishment of industrial enterprises. Sample and satisfactory references offered. Address: Y. Demola Locking (Pan-American Industrial Representative), P. O. Box 1801, Santiago, Chile.

DUPLICATORS AND DEVICES

A DUPLICATOR \$1.00. Letter size. Make over 50 copies from pen or typewriter original. Send for circulars, Schenck Laboratories, Dept. 1, Madison, Maine.

THE Modern Duplicator, made without glue or sewing, is the World's Standard. Fifty in variety—the exact duplicate copies can be made from each one you write or draw with pen, pencil or typewriter. \$2.40 to \$5.00 according to size. Booklet Free. Durbin, Reeves & Co., Mfrs., 239 Fifth Ave., Pittsburgh, Pa.

FOR ADVERTISERS

If you can increase your sales 15% with stronger trade letters, you lose money not to do so! M & M will give your field and your business exhaustive study, then construct letters that must bring you orders. Martin & Miller, Advertising Counselors, 239 Fourth Avenue, New York.

2c WORD advertisement and one year subscription 25c. Extra words 1c. Circulation 25,000. Digest, Grand Rapids, Mich.

ADVERTISE—Here's your opportunity. Your proposition placed before the readers of "Cartoons Magazine" for only 2c per word. Circulation 30,000 copies guaranteed. Send a trial ad for our next issue. Cartoons Classified Dept., 6 N. Michigan Ave., Chicago, Ill.

YOUR 24-word ad in our big postcard magazine, 25c. Inch display, 50c. Elliot Exchange, 2327 N. Kenneth, Chicago.

10,000 BOYS read our large, 2x12 magazine. Display 6c line. Minimum 7 lines. Classified, 1c word. Minimum, 25c. Two insertions 15% discount. Youth's Magazine, Chicago.

ADVERTISE in 133 different magazines: special price, 5c a word. Lists free. Write King's Magazine, Box 12-17, Little River, New Jersey.

PERSONAL

If you like "Real Fascinating" books, pictures, novelties, etc., send dime for sample hand-colored photo of beautiful girl in "Revealing Pose" and illustrated catalogue, sealed. You'll want more. Williams Publishing Co., 721-13 North Dearborn, Chicago, Ill.

GET valuable mail whole year, thirty cents. P. Cornish, Scheuchstadt, N. Y.

ST-STU-T-T-THING or Stammering. Let me tell you, by mail, how I cured myself, after 30 years of misery and failure. Discovered a natural method which anyone can use, at home. Since then have won social and business success. Send me your address, in confidence. Walter McDunnell, Drawer 5511, Station-F, Washington, D. C.

"QUIT Tobacco" my harmless way. Quick—Secret—Pleasant—Inexpensive. Interesting Booklet Free. J. Bradford, Asheville, N. C.

RHOTHEN—Accidentally discovered root cures tobacco habit. Gladly send particulars. P. Stokes, Moline, Florida.

AGENTS WANTED

DISTRICT Managers: We have an organization of National Reputation, a high-class product essential to every merchant, a clean-cut method of doing business. We will give the right men as big an opportunity as the most successful representatives in any specialty company have ever received. If you have good habits, health, brains, plenty of "zip" and selling power, and ability to trade and manage a small sales force, you can make big money. Your earnings will be limited only by your energy and ability. Write for particulars, New Era Mfg. Co., 450 4th Ave., New York City.

ATTRACTIVE Peace Postals showing six rulers peering; beautiful in Art and Poetry; sell on sight to everyone, especially in Church Pairs or Bazaars. Net profit given in Red Cross Society. Samples 5c. quick action. Vondrahn, 444 West 149th St., New York.

AGENTS Wanted. Great opportunity. You can make big money—\$30 per day—with little effort, just showing to your friends our new spring and summer sample line of made to measure tailoring. Complete outfit ready to start business sent you absolutely free. You can wear the sweetest clothes in your town and always have your pockets full of money. Write today—quick—for the agency in your locality before some one beats you to it. Just mail a postcard to the Reliable Tailoring Co., Dept. 201, Chicago, Ill.

SAFETY First! Sell our line of Sanitary Twisted Wire Brushes. Big income assured. Exclusive territory given. Goods sell themselves. Households, Offices, Catalogue free. 3 in 1 Brush Co., 105 Beckman Street, New York.

AGENTS. Sit down and write this minute for free circular of our great war book. Ward Publishing Co., Box 433-P, Chicago.

AGENTS—Geo. Hiri, Russell Ave., Indianapolis, is selling changeable signs at 3c each. Particulars free.

AUTO Bob Sted (patent pending), tremendous demand wherever snow and boys. Box 215, Inwood, N. Y.

AGENTS wanted handle merchandise direct from manufacturer. Cheesent Comb Co., Box 442, Leominster, Mass.

MAIL-ORDER instructions complete and 25 propositions to begin with. Literature free. Write 1. Hale, Box 1920, College View, Neb.

MAGAZINE subscription solicitors; crew managers. 50c proposition will sweep country. New plan. Get in quick. Co-operation Co., 367 Arcade, Cleveland.

BIG Kansas Company will start ambitious man or woman in fast growing business; any locality; \$3,000 yearly; spare time; no canvassing; no experience. We furnish everything. Write for unique selling plan. C. W. Rysstone, President, 169 E. 5th, Pittsburg, Kansas.

LET me start you Manufacturing and Selling Extracts. H. Lake Co., Adair, Ill.

SELL Oil Painted Pillow Tops. Beautiful designs. Retail \$1. Cost \$4 doz. Complete sample and particulars 25c. Fantasy, 321 Dearborn, Chicago.

READ the Agents Magazine and make more money. 2 issues 10c. Agent's Magazine, Chicago.

NEW, practical, profitable specialty. Every merchant buys. Snap for agents. Columbia Co., 115 North Ave., Chicago.

AGENTS Wanted—If you know a chance when you see it you'll see this one now. Big money—stylish, nifty clothes—little work—no experience or capital needed—can you beat that? We want agents everywhere to take care of our business in their localities and to advertise our nobby, nifty suits by wearing them. We furnish everything complete and charge nothing for agents' outfit. The swiftest dressers, everywhere are our agents and all we ask is that you tell people who inquire about your fine clothes where and how they can get them. You make big money—\$30 a day—without trouble. Just a postal brings you full outfit free. Big, new sample book of up-to-the-minute suitings sent so you can pick out your first suit; also measuring blanks and everything you need. We pay express on everything—not a penny for you to pay. Send quick before some one else gets the agency there—mail postal today to the American Woollen Mills Co., Dept. 214, Chicago, Ill.

PERFECTION Pocket Adding Machine. Lightning seller. Agents wanted. Cincinnati Specialty Mfg. Co., Dept. R, Cincinnati, Ohio.

AGENTS—Get our Big Three selling combination. Hundreds of recorders. Exclusive territory. Sample free. A. Lehner, 730 West 19th Street, Chicago, Ill.

DISTRICT Managers. have few openings for the district managers to handle exclusive territory. Sample specialty for hardware and automobile trade, exceptional standing and financial ability in carry stock essential. Junkens Bros., 902 W. 71st St., Chicago.

ELECTRIC Chairs—Big fun maker for clubs, societies, amusement places; send for circular; agents wanted. Odenwald, 1244-H-N.W., Washington, D. C.

AGENTS. 100%. Desirable goods. Reputations, Lorna Laboratories. Cambridge Ridge, Chicago.

GUARANTEED heavy manufacturer selling direct to consumer wishes agent in every county. Permanent, big paying business. Protected territory. Credit. D. Parker 3018, 2732 No. 15th St., Phila., Pa.

AGENTS—Best proposition you have seen. Particulars free. J. F. Woodard, Norfolk, Va.

MAKE and sell chewing gum. Big profits. No machinery needed. Complete instructions, 10c. Service Bureau, 2311-B, Halaplane Ave., Chicago.

DON'T waste your energies!—Sell our attractive brass steel poster frames to theaters; big demand; easy sales; liberal commissions. Newman Manufacturing Co., Cincinnati, O.

AGENTS make 35 profit daily. Name Plates, House Numbers, signs. Particulars free. Roscoe Lynch, Hannan, Pa., Dept. R.

AGENTS, Mail-Order Dealers, see our New Safety Tea Kettle Illustrated January issue, page 113. Get particulars. Weber Manufacturing Co., 1005 Warner Ave., Peoria, Ill.

PLEASE don't answer this advertisement unless you mean business! \$1.50 Sample Free, Fountain Pen Searchlight Co., Hartford, Conn.

AGENTS. Send now for list of 342 nifty beach show cards. Ward Publishing Co., Box 433-P, Chicago.

SALESMEN Agents; for excellent staple advertising medium; pocket samples; liberal commissions. E. N. Dorling, Weehawken, N. J.

AGENTS—New game for cigar stores; easy seller; big repeater. Particulars free. United Sales Co., 205 Walnut place, Philadelphia, Pa.

AGENTS—Sell transparent handle pocket knives and razors. Liberal commission. Write for terms, Morris Cutlery, Morris, Ill.

AGENTS—Fifteen Wholesale Sellers, new in your territory; pay you steady income \$5 a day or better if you are a worker. Liberal credit. Sample case and outfit free to workers; control of your territory and other advantages. Write quickly for proposition. E. E. Briley, Box No. C-733, Linton, Indiana.

INK Eraser. Best yet. Sample 25c. Agents wanted. Ya. Sales Co., Box 321, Winchester, Va.

80% PROFIT—Art Show Cards—Every merchant buys. Samples 10c, worth 50c. Merchants Specialty House, Chicago.

1,000% PROFIT—Prepared Sign Letters. Share co-operative business free. Johnston Co., Quincy, Ill.

AGENTS Wanted—Right here is the one big chance of your life. If you want to make good money—\$10 a day or more, as easy as rolling off a log, and get your own clothes free besides, you can do it by acting as our agent. We are the biggest people in the business and want our agents to make big money and be happy, stylish dressers. Send a postal today for free \$10 outfit, including a big book of nobby selling samples to select your own agent's suit from. Then take orders from people who admire your nifty clothes. They come to you—not you to them. This is the way to get rich—the sure, easy way. Remember, you need no money—everything is furnished by us free. We pay express on everything. Just send a postal, but do it today. You can't get started too quick, making this big money and wearing these stylish clothes. Address card to Paragon Tailoring Co., Dept. 211, Chicago, Ill.

AGENTS—Average \$5 to \$12 daily selling astonishing Aztec massage machine. New, just patented. Different. No electricity or water power required. Nothing complicated. Affords exhilarating massage without rent expense. Lowest priced, but best outfit. Retail \$2.50 allowing you big end of the profit. Particulars and "beauty" folder free. Aztec Remedy Co., Dept. 132, Toledo, Ohio.

100% PROFIT—Exclusive territory to first man. Dollar Safety Razor sells quickly. Send \$5 for samples today. De-Hart Co., Hollister, N. J.

AGENTS—500% profit. Free sample Gold and Silver Sign Letters for store fronts and office windows. Anyone can put on. Big demand everywhere. Write today for liberal offer to agents. Metallic Letter Co., 405 N. Clark, Chicago, U. S. A.

AGENTS—Graham's Self-Gartered Socks. Patented. Price no higher. Guaranteed never creep down. Fine gauge, wear for ever quality. Big sellers. Send \$5 for samples. State size. Graham Company, 555-P, Forest Ave., Oak Park, Ill.

NEW 1914 Model—Send no money. Just your name written plainly on a postal card and learn by return mail how to get the best Vacuum Cleaner on the market, without costing you one cent! We are putting them out for demonstrating purposes. Guaranteed 5 years. Reliable, live agents wanted everywhere. Write today to Warner Vacuum Cleaner Company, Dept. 2, Mauncie, Ind.

AGENTS Wanted—Agents make 500 per cent profit selling "Noddy Sign Cards." Merchants buy 10 to 100 on sight. 800 varieties. Catalogue free. Sullivan Co., 1231 Van Buren St., Chicago, Ill.

GET Money—I did; got \$301.27 in two weeks doing nothing, writes M. L. Smith of Pennsylvania (used small outfit); start as Smith did—that's easy; hundreds already started, money coming in, goods going out; people everywhere have tableware, watches, jewelry, etc., for the "Gray Plating Man." Practical outfit, all sizes, heavy plate, guaranteed. Pure Gold, Silver, Nickel, Metal Plating, latest process, taught free, quickly; experience unnecessary; secrets exposed; own and boss a business that pays \$15 to \$50 weekly—you can; write today. Gray & Co. Plating Works, 427 Gray Bldg., Cincinnati, Ohio.

200% PROFIT. You can't beat it. Sell everywhere. Free pocket sample. Our goods get the orders. Wm. J. Dick, Mgr., Dept. S-1, 20 W. Lake St., Chicago.

MAGIC Ink Eraser. No blade, no acid. Removes ink like magic. Sells like bread in a famine. Sample 10c. Sells 25c to 35c. R. Mfg. Co., 55 N. Warren St., N. Y.

YOU can be your own boss with our Key Check Outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 15 cents. Penn Die Works, Dept. M, Winchester, N. H.

AGENTS—500% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Matthews, 1902 Third St., Dawson, Ohio.

WE manufacture the largest line of Aluminum Utensils and Specialties in the world. Sales course free. \$50 a week easy to business. Answer quick. American Aluminum Mfg. Co., Dep. P.M., Lemon, Ill.

OUR national advertising helps you sell Fuller Sanitary Brushes and Dusters Mops and Dusters—full line—easy sellers. We tell you how. Biggest factory for twisted wire brushes in U. S.—reliable, strong concern. Your territory is valuable. Write at once. Fuller Brush Co., 33 Broadway Place, Hartford, Conn. Western Branch, Rock Island, Ill.

AGENTS who have the gut to tackle a job and sell. Men and women who will tell the truth and want to make money and can give all or part time. Then we will trust you to \$2.60 worth Starr's Powdered Putty. It repairs chipped and rusty spots on grime-ware. Stops all leaky metalware without heat, soldering iron or tools. A case-knife does the trick. Never hardens in the box. Hardens in a few hours after mixing with soft water. The newest and best selling household necessity now on the market. Agents all earning money, selling at every home, shop, office, factory, garage, Chas. B. sells for 25c. A free premium with every sale. He gets large sample and particulars. Heiter get on our free mailing list. Starr, 1319 Monroe St., Toledo, Ohio.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhes, Desk C. R., Omaha, Neb.

BIG Profits for You! Manufacture Harley Cigar. New Confection. 5c package costs you 1c. Machine, instructions complete \$7.50 prepaid. Send 10c for samples. Harley Cigar Co., 1205 Broadway, San Francisco.

AGENTS—Sell rich-looking imported 56x 68 Rugs, \$1 each. Carter, Tenn., sold 115 in 4 days. Profit \$57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post prepaid, 98c. Canton, Importer, Stouffville, Maine.

500% PROFIT selling our wonderful slat letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 405 N. Clark St., Chicago.

AGENTS—Drop dead ones. Awake! Grab this new invention. Low-priced, waterpower home massage machine. Magical, marvelous, mysterious. New field. Big profits. Sold on money-back guarantee. "Marguerite" sold 5 in 10 minutes; \$1 in 3 days. "Packer" sells 3 first day. Vaughan, "your machine has merit. Express 6 chosen." Free information. Blackstone Co., 31 Meredith, Toledo, Ohio.

YOUNG MAN, would you accept and wear a fine tailor-made suit just for showing it to your friends? Or a \$100-on balance free? Could you use \$5 a day for a little spare time? Perhaps we can offer you a steady job! If you live in a town smaller than 10,000, write at once and get beautiful samples, styles and this wonderful offer. Banner Tailoring Co., Dept. 924, Chicago.

EASY pleasant work for Merchants, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Big Pen Company, Dept. 2, Baltimore, Md.

AGENTS make \$300 monthly selling our 500 handy household articles. Catalogue free. Schuff Company, Bensalem, Pa.

OUTFIT Free to Agents. Best selling Handkerchiefs, Dress Goods and Fancy Goods on the market. Quick sellers. Big profits. Deal direct with a large manufacturer. Send stamps for particulars. Presport Mfg. Co., 55 Main St., Brooklyn, New York.

BIG Textile Mills will employ everywhere reliable people to take orders for dress fabrics, hosiery, underwear and neckwear from samples. Factory prices. Many making over \$20 weekly. Spare or all time. No experience. Permanent. Steadfast Mills, 80 Benson St., Chicago, N. Y.

AGENTS—Stunning names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emboss Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 305 Degraw St., Brooklyn, N. Y.

FIRST dozen free to agents, men, women, demonstrate 25c household article. Quick seller, exclusive territory, constant repeater. P. M. King, Condorport, Pa.

MEASUREMENTS—300% profit. Make up your own goods and be independent. Catalogue free. Roska Co., 1285 Randolph St., Chicago.

MAIL-ORDER Opportunities: 25 new Propositions. No competition! Make 95c profit on dollar order; complete outfit 10c. Mail Dealers Wholesale House, 521 Franklin Bldg., Chicago.

\$50 TO 400% Profit to Agents selling our guaranteed U. S. Fire Extinguishers. Tremendous demand. Orders repeat. Exclusive territory to county and district managers. United Mfg. Co., 1925 Jefferson, Toledo, Ohio.

AGENTS make \$5 to \$10 a day on the spot. Allinson writes: "The best proposition I have found in my forty years' canvassing." Permanent work. Household necessity. Selling 80%. Write today for General or Local Agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

FROM Dance Hall to White Slavery, 400-page, cloth book, illustrated, \$1, immense sale. Experience unnecessary. Outfit free. Big money quick. Charles C. Thompson Co., Manufacturing Publishers, 1128 Wabash Ave., Chicago.

AGENTS—Here's a winner. The Midget Vest Pocket Garment Hanger—sells on sight. The most attractive proposition ever offered, 150% profit. No competition, as article is fully protected by U. S. and foreign patents. Address: Dept. "M," The Silver Company, 171 Madison Ave., New York.

PHOTO Pillow Tops, Postcards, Frames, Sheet Pictures, Photo China Plates. It-jects credited. Prompt shipments; samples and Cat. free to agents. 30 days' credit. Jas. C. Bailey Co., Desk A-3, Chicago, Ill.

AGENTS—Great opportunity to be permanent representative largest manufacturers high-grade soap and toilet goods. \$25-\$75 weekly. Write for immediate appointment. E. M. Davis Co., R. 64, Dade Bldg., Chicago.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 462 Third St., Dayton, Ohio.

AGENTS—\$50 weekly. We manufacture the best needle case made; a wonderful seller; 200% to 500% profit; talking unnecessary; our "Trust Scheme" envelopes do the work; general agents can make \$100 weekly; particulars free; 25c sample outfit for 10c; pack direct from the factory. Puffy Needle Co., 102 Davis St., W. Somerville, Mass.

YOU can make \$888 as our general or local agent. Household necessity; sweep 80 per cent; permanent business; exclusive territory; safety or commission; free sample; profit. J. Finken, 112 Reid St., Newark, N. Y.

AGENTS of ability and high character wanted on a new household article. Over 100 per cent profit. Special selling plan that pulls results. Address: Merritt & Brock, 10 to 50 Temple Place, Boston, Mass.

AGENTS—Make big money selling our automobile specialties to owners and dealers. Send for particulars. Leather Tire Goods Co., Niagara Falls, N. Y.

AGENTS. Cost 3c, sell 25c. Gold window letters. Any one can apply. Samples free. Chicago Letter Co., 3513 Lincoln Ave., Chicago.

AGENTS: \$1,000 to \$3,000 yearly selling over eighty everyday articles to farmers. Pleasant, permanent business. Full instructions. Big chance. Write quick. Duofarm Factories, North Jara, N. Y.

AGENTS—Here's the best line of food flavors, perfumes, soaps, toilet preparations, etc., ever offered. No capital needed. Complete outfit furnished free to workers. Write today for full particulars. American Products Co., 561 Third St., Cincinnati, O.

AGENTS—\$15 profit on two sales a day. Machine line seller in saloons. Free sample and salesmanship course. Write Mohler, 1059 North California Ave., Chicago, Ill.

BUYERS. Mail Order Men. Agency Houses: List or push the Pocket Safety Lock. A necessity for everyone who travels, lives in hotels, apartment houses, or those who want their apartments, office, or store secure from burglars. Big profits, low prices quoted everywhere. G. F. Taddei, 265 West 87th St., New York, N. Y.

AGENTS—Send 10c for terms and sample of staple 25c article. Large profits. C. Lutz Manufacturing Co., York, Pa.

AGENTS, splendid seller, big profit, for housewives, motorists, farmers, mechanics, electricians, plumbers. Write us. Biddle Distributing Co., Dept. A, 89 Wall St., New York.

AGENTS—"Bully Sunday's Book" (unauthorized); illustrated; wonderful selling success. One agent sold 42 books in five hours; others earn \$6 to \$15 per day; little work. Every Christian home wants copy. Circulars, with names and address, furnished mail order dealers and agents. Write for terms; outfit free. Marcello, Binghamton, New York.

AGENTS—A free course in General Salesmanship is given to every man of our Sales Organization. This organization is a body of successful men selling the Handy Light; that unique electrical device which cuts the cost of electric lighting in half. Sells for \$3.50, is used in home, office, store, factory; weighs only one pound. Sold by demonstration. All agents furnished with well planned methods for gaining interviews. A high-grade business for a man of ability and standing in his community. General Agents preferred. Inquire for our full proposition by addressing The Handy Light Co., 199 Handy Light Block, Cincinnati, Ohio.

UNIQUE repeat order novelty; advertiser; mails fast; unusually big profits; particulars free; photograph prepared for 32 pictures free; money back if you cannot produce real photos with this sample without using camera. Inoue Co., 2141 Seventh Ave., New York.

ONE drop "Venere" Solution, three ounces Paraffine Oil, one ounce water, total cost one cent, produces 25-cent bottle high glass furniture polish. Sells wonderfully. Agents enthusiastic. Bottle Venere Solution and Polish Formula, 25 cents (allies). Paradox Company, Yonkers, N. Y.

AGENTS—We have a winter seller that will bring you a mint of money. Every home, office building, factory and store requires it. A real money, labor and time saver. Send 25c for sample and particulars. Cold weather creates big demand. W. E. Co., Dept. M, Delta, Colorado.

MAKE and sell your own goods. Our Information Bureau tells how. Fine Formula Catalog for stamp. B. Mystic Company, National Union Building, Washington, D. C.

QUICKENLIGHTING cleans the hands quaternizing. Agents wanted, Joliet Novelty Company, Joliet, Ill.

SURE Profits for house to house canvassers, either sex, carrying our Mountain Spring Filters. Plus any favor. Knupper Filter Co., 20 West 40th St., New York City.

MYSTIC Photos—Photos without a camera. Never before considered possible. Marvelous results. Entertains and astonishes. Makes pictures instantaneously. Trial satisfies or money back. Send 10c for samples. Enough for 32 pictures. Alpharic Co., Longbeach Building, New York.

IT will pay you to write me before taking any agency for guaranteed aluminum utensils. Wm. J. Dick, Mgr., Dept. F-12, 20 W. Lake, Chicago.

AGENTS—Souvenir Badges Kaiser Wilhelm. Send 40c for dozen. Big profits. Philadelphia Badge Co., 134 N. 3rd St., Philadelphia, Pa.

PORTRAIT Agents make big money selling our goods. Our quality is right. Prices low. Delivery guaranteed. Credit for returns. Ask for our latest catalog. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

ENDLESS Neckties—Something new, twelve ties in set, costs no more than old style; man made \$70, three days; woman made \$12, week; write for special agents' offer. Rudless Necktie Mfg. Co., Dept. 10, Kansas City, Mo.

NEW Automatic \$2.50 Adding Machine. Sell 10 a day easy. Big profit. Everyone buys. No competition. Irresistible offers. P. Bassett, 5621 Indiana Ave., Chicago.

ENGROSSER made \$42.50 in 8 hours with Plateless Darkark taking Photos direct on cards, finishing instantly. Experience unnecessary. Trial proposition free. Darkark Specialty Co., Dept. H, St. Louis, Mo.

400% PROFIT—Energrip Gliders—No rollers; pocket samples free; anyone can attach; cost 3c, sell 15c; homes buy dozens, hotels hundreds; save floors and carpets. S. Mfg. Co., 2411 Warren St., N. Y.

GOODLUCK booklet containing your name and address on 120 gummed labels, 25 cents postpaid. Big profit for agents. Wiley Publishing Co., Kansas City, Mo.

AGENTS—Get particulars of one of the best paying propositions ever put on the market. Something to sell else sells. Make \$4,000 year. Address R. M. Feltman, Sales Mgr., 569 Third St., Cincinnati, O.

AGENTS Wanted for a new Duplicate. Sells to every business man. Fisher Company, 112 Amsterdam Avenue, New York City.

AGENTS, either sex; big money selling our new high-grade household specialties; a sale at every home; write today. Hellicka Specialty Company, 1645 Haskell Avenue, Rockford, Ill.

AGENTS are making money selling our big 10c Packages of 30 Assorted Postal Cards, "5,000 Variables." "Big Profits." Sell everywhere at Sight. Sample Package 10c. Particulars Free. Sullivan Card Co., 1234 Van Buren St., Chicago, Ill.

SQUARE Hole Drill, metal or wood; rotary motion; seven sizes, retail \$1.00, wholesale \$2.75 dozen sets, prepaid. Agent's sample drill and guide 30c postpaid. Frederick Stolle, 1238 Mission St., San Francisco, Cal.

50 TO \$15 a day easily made selling our Guaranteed Fire Ratings; (tremendous demand). Send for particulars. Emmons Supply House, 164 Springfield, N. J.

STEADY business, liberal profits, quick returns with our Sanitary Wire Frame Brushes and Cleaning Specialties. Household necessities. No capital required. Exclusive sale if you write today. Kleaned Co., 71 Taylor St., Springfield, Mass.

AGENTS, Imperial Products and free advertising plan get the orders. Particulars free. Fugate, 2844 Harrison, Kansas City, Mo.

AGENTS—Sell our Household Specialties in every home. Catalogue free. Peasgood Sales Co., 56 Whitaker Ave., Providence, R. I.

YOU can make big profits selling our Order Filling Line of Guaranteed Goods. \$200,000 firm and Liberal Credit Plan backs you. Valuable Premiums for you and for your customers. Wm. J. Dick, Mgr., Dept. 8-21, 20 W. Lake St., Chicago.

WE want live, energetic agents in every locality to handle first-class specialty. Particulars Free. Write today. Manchester Mfg. Co., 227 East Cedar Street, Des Moines, Iowa.

AGENTS—\$2.50 razor free to buyers. "Try-it-before-you-buy-it" plan sells Climax Automatic Razor Sharpener to every man; 150% profit. Write quick for territory, guarantee and free offer. Victor Specialty Co., 15 Victor Bldg., Canton, O.

BUTTER 4c per pound in five minutes by adding milk. Small machine, just out; everybody interested; big commission. Agents wild. Two dollars gets sample and holds territory. Write instantly. L. A. Brown & Co., Clay Center, Neb.

STOP HERE—Agents, Salesmen—Just Out—brand new invention. Splendid seller. Deflector for Automobile Headlights—puts light on the road instead of in other people's eyes. Not a dimmer—makes driving light stronger. Endorsed everywhere. No knobs to turn—no adjustments—lasts as long as the car. Simple, easy to put on. Washed on every car—sells like lightning. Nothing like it patented. Big profits—Listen: Johnston, Ohio, made \$22 first day. Harris, N. Y., made \$48 one week. Walker, Iowa, cleared \$58 in three days. Hurry—write for details—Sales guaranteed—no charge for territory. Address the Birkmeyer Deflector Company, 443 B. & B. Bldg., Toledo, Ohio.

\$15 WEEK Salary and Commission paid one person each locality, taking orders for non-alcoholic beverages and toilet articles. Linton Co., Kansas City, Mo.

AGENTS—Sell "The Yankee" electric iron cord supporter. Sells on sight. Sample 50c. Particulars free. Polson & Paulson, 30 Huff Ave., La Grange, Ill.

STOP here and write The Sign Co., Silver Creek, N. Y.

NEW—Practical—Durable. The J. S. Self-Threading Sewing Machine Needle sells like "Hot Cakes." The only one of its kind sold with a guarantee. Made to fit all machines. Send 10c at once for sample and territory. The Rosell Specialty Co., Peabody, Conn.

I HAVE a contract to distribute a million free packages Borax Soap Powder. Want reliable men and women to help. Chance to earn good pay. J. Waverly Brown, 130 N. Franklin St., Chicago.

MILLION Dollar Winner. Tremendous, rapid sales stager country. Agents happy, banking enormous profits daily. New invention, yet million sales already recorded. Walters sold 51 first 7 hours; Arnold 80 first day. Everybody wants Grabs Scientific Shoe Cleaner on doorstep. Saves drybrush, carpets, shoes, money. Automatically removes mud, snow. Mechanical wonder. Investigate quick. Territory free; worth fortune. Security Mfg. Co., Dept. 46, Toledo, O.

WANTED—Men and women canvassers to handle new kitchen article. Easy seller, never been seen before. Exclusive sale to hustlers in outside towns. Experience unnecessary. Satisfaction guaranteed. Write Kobelle Mfg. Co., Box 308, Central Station, Toledo, O.

NEW money-maker for agents, see page 145, advertising section.

OUR Leaders: Hygienic Milk Bottle Holder, "Dandy" Man Box, "Dandy" Kitchen Set. Catalog, 50 Specialties, free. Weymouth Household Supply Co., Box 287, Springfield, Mass.

SEND dime for calculator; figures parcel postage, any size, quick as a wink; simple, accurate, useful; agents wanted. H. Stearns, Sales Manager, Schenectady, N. Y.

AGENTS wanted for our splendid line gold stem letters, 500-1,000% profit. Anyone can put on. Unlimited demand. Five samples 10c. Everette Co., Long Island City, New York.

SAMPLES Free to Agents—Quick selling line of Dress Goods, Good steady profit. Send stamp for particulars. H. M. Kennedy, Jr., Co., 357 Fourth Ave., New York.

INOLENE—New, handsome and useful article; sells itself. Send 5c cents for sample and mention territory wanted. Adams Novelty Co., Westmont, N. J.

START 1915 right. Glance specialties needed in every home. 100% and exclusive territory. Write now. Glen Co., Edgewood, R. I.

AGENTS—To solicit orders for Finest quality Business and Calling Cards, write for sample and profit sharing plan, Sterling Print. Dept. 31, Sterling, Mass.

JUST out, 300% profit; large changeable sign with 240 letters, 30c complete. Every merchant buys. Changeable Sign Co., 589 E. 1st St., Cleveland, Ohio.

NEW. Three good selling novelties. Patented; big profits. Stamp for circulars and prices. Edw. Hutchinson, Winsor Ave., Edinboro, N. Y.

SIGN Agents, Attention: We have something to offer you that beats selling other peoples' manufactured letters and signs all to pieces. No previous experience is necessary. Investigate. Address, Ross System, 261 Lincoln Ins. Co., Cincinnati, O.

AGENTS—New invention, Electric Cigar Lighter. Used on cigar cases. Quick seller to Hotels, Drugstores, Restaurants, Pool-halls, Cafes. Big profits. Special offer, Drake Mfg. Co., 142 Reed St., Milwaukee, Wis.

3-4 WEEKLY easily selling newly patented article. Every woman a buyer. G. C. Coffman, Box 55, Huntington, Penna.

BARGAINS—Men's Neckwear. Agents, stockholders. Webster, 477 Eighth Avenue, New York.

SPECIAL—Your ads in 133 different magazines, special—3c a word. Lists free. Address, King's Magazine, Box 1508, Little Silver, New Jersey.

MY Mail-order business pays handsome profits. Particulars free. Zerbe, Sacramento, Penna.

AGENTS, either sex, sell Du-Ro-Co skin and scents soap, perfumes, toilet articles. Big profits. We help earnest workers. Collico, 129 N. Second St., St. Louis, Mo.

AGENTS, Hosiery Free. Big cash commissions. Low prices. Guaranteed. Made to measure. Men and women. Free samples. The Brookline Co., Dept. B, Springfield, Mass.

PANAMA Coin Jewelry. Pin 10c, Chain 15c, Links 25c, or set 50c. Mail Order Supply Co., 228 Broadside, Pittsburgh, Pa.

AGENTS to take orders for Valuing and Business Cards. Large profits. Outfit free. Farnham Primary, Waterbury, Conn.

AGENTS—Salary or commission. Greatest seller yet. Every user pen and ink buys on sight. 20c to 50c per cent profit. One agent's sales \$629 in six days; another \$32 in two hours. Monroe Mfg. Co., N. O. La. Cross, Wis.

"JIFFY" Ironing Board Cover and Clamps is the biggest red-hot seller ever invented. 150% profit. No competition. Lake Shore Manufacturing Company, Michigan City, Ind.

STOP here and write The Sign Co., Silver Creek, N. Y.

AGENTS—\$10 daily easy selling Clean compound through our new sales plan; everybody buys; no talking or experience required. Send 10c for samples and proposition. Address Morgan, Box 554, Salisbury, N. C.

INVENTOR'S Advocate, Washington, D. C. Best inventor's paper. One year on trial 10c.

WE Pay \$80 a month salary and furnish rig and all expenses to introduce our guaranteed poultry and stock powders. Address Higley Company, N368, Springfield, Illinois.

\$61.50 WEEKLY Introducing and selling a new gas light burner for kerosene lamps. Beautiful light. No chimney. No mantle. Perfectly safe. Simple in construction. Nothing to get broken or out of order. Will not burn out. Durable. Will last for years. Low price. Easy to sell. 200 per cent profit. Experience not necessary. Sample free. Why not try one on your lamp? Beware of imitations. No branch offices. Luther Manufacturing Co., Dept. 461, Cincinnati, Ohio.

SELL Dry Goods Remnants. Greatest bargains on earth. Remnant Store Co., Cincinnati, Ohio.

WE have several openings for establishment of independent mail-order business. Energy, good habits and sound judgment more important than capital. Spare time at first. Particulars free. Opportunities Exchange, Buffalo, N. Y.

AGENTS. Apple-ene Figs, laxative, best proposition! Special territory. Big profits. Great repeater. Holds customers. Permanent business. Life insurance. Samples and particulars free. Laxative Fig Co., 2545 Graham Ave., Louisville, Ky.

WANTED—Agents everywhere to sell the famous "Crescent" 4-cylinder light delivery motor trucks, completely equipped, \$550 and freight, fully guaranteed. Absolutely no competition at this price. Several thousands now in use proves that "Crescent" cars sell themselves. Address the manufacturers, Mission Motor Car Company, 1312 South Grand Ave., Los Angeles, Calif.

WANTED—Distributors. Men and Women—to give away free pkgs. Perfumed Borax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 218 Institute, Chicago.

FLORIDA—Replicates, please. Agent's package 10c. Sells fast; show it, that's all. Big profits. Shur-Ax Company, Portlucket, Ill.

AGENTS—Smash poverty. 50c profit every 75c sale. Our specialty sells all homes, stores, offices. Daily use makes quick, steady repeater. Bonuses for increasing sales. Experience, capital, unnecessary. \$10 week away. Get protected territory quick. Rikhart Specialty Co., Rikhart, Ind.

EASY money selling Self-Threading Needles. Everybody buys. Send stamp for sample. Write for territory. Rudke Co., University City, Mo.

\$35 TO \$100 weekly made easily selling our match lighting systems and portable lamps; they sell like wildfire both in towns and rural districts. No experience necessary; exclusive territory to right parties. Write for Free catalogue and full information; this is an opportunity of a lifetime. Bond Lighting Company, 174 D, No. Sangamon, Chicago.

STOP here and write The Sign Co., Silver Creek, N. Y.

AGENTS—To sell the newest electric appliance on the market; sold everywhere there is electricity, in the home and office; liberal profits; sales-driving sample, weighs a pound, no experience or knowledge of electricity required; it shows how to use one light instead of two and get the same results; sells for \$3.50 and saves the purchaser an investment of \$25. Write for particulars. The Handy Light Co., 15 Handy Light Block, Cincinnati, Ohio.

SELF-WRINKING Soap. Hands don't touch water. Demonstrate in an instant. Gets into corners. Price right. Big profits. Your territory valuable. Write today. Secretary, 711 Hartford Bldg., Chicago, Ill.

AGENTS sell rich-looking imported 24c/88 rug \$1 each. Carter, Tenn., sold 115 in four days, his profit \$57. You can do as well. Write for sample offer and selling plan. Sample rug by Parcel Post, prepaid, 98c. A. Cordon, Importer, Stonington, Maine.

MANUFACTURERS of high-class, exclusive electrical specialties want man of proven ability and unquestionable standing; familiar with big propositions, for General District Manager in all open territory. May require investment up to \$500. Should net \$3,000 to \$5,000 first year. State age and experience. The Sterling Corporation, 1256 West Third Street, Cleveland, Ohio.

AGENTS: Big profits selling our New Electric Light specialty to offices, homes, stores, factories, hotels, etc. Greatest convenience and most practical device ever invented. Sells rapidly. Demonstration means sale. Write quick for excellent proposition. International Automatic Utilities Co., 402 Marquette Bldg., Chicago.

SALESMEN: agents everywhere. New auto fuel. Permanent. Profitable. Tankful Chemical Sales Co., Cleveland, Ohio.

SALESMEN WANTED

WANTED: Reliable Salesmen to handle one or more States exclusively. Also China, Czechoslovakia and Glass dealers to sell our improved Sanitary Sugar Bowls. For particulars write Schenck & Pease, 6212 Penn Ave., Pittsburgh, Penn.

SALESMEN wanted. Automobile Specialty. Sells fast. Demonstration easy. Carry sample in pocket. Big profits. Particulars free. Famer Co., Lancaster, Pa.

MANUFACTURER requires general agents for patented demand of centuries. Self-administrator. Financial independence to acceptable parties. S. C. Osborn, Masonic Temple, Chicago.

SALESMEN—Get our plan for Monogramming Automobiles and Motorcycles by transfer method. Very large profits. Motorists' Accessories Co., Ashland, Ill.

SALESMEN wanted who have capital to invest in territory for a new invention. Has prospects of being good seller. Write for full particulars. Address J. W. Barfield, Music Loan Turner, East Chatham, N. Y.

WANTED—Helpers to take orders for made-to-measure, high grade men's tailored suits from \$9.00 to \$23.00. Make \$25.00 to \$30.00 weekly. Elegant large look outfit free. Experience unnecessary. No pocket folder affair. Splendid opportunity to make money. Handy Dandy Line, Dept. S, Sangamon St., Chicago.

SALESMAN—Experienced traveling salesman. State experience and references first letter. Well advertised line. Satisfactory commissions. The Limeges China Co., Sebring, Ohio.

TRAVELING Salesmen Wanted—Experience unnecessary. Earn big pay while you learn by mail during spare time; only eight weeks' time required, one or two hours a day. Steady position, easy work, hundreds of good positions to select from. Write today for free book, "A Knight of the Grip," containing full particulars and testimonials from hundreds of students we have recently placed in good positions and who are realizing \$100 to \$500 per month. Address Dept. B-16, National Salesmen Training Association, Chicago, New York, Kansas City, San Francisco.

WANTED—If you are an experienced and successful salesman, we want you on our force; have a high class, 6c, ten-year bond, with stock bonus. For information, address, Exchange, 580 Wesley Roberts Building, Los Angeles, California.

SALESMEN—Agents: Competition killed. Electric Flashing sign; over 26 different display arrangements possible with 210 three and six inch letter combinations—in colors. 30-inch model \$10. Sample to producers. Multiform, 367 Manhattan Bldg., Chicago.

GREAT opportunity for general agents selling new specialty to merchants; totals \$3, \$10, \$25 each. Your profit 200%. No competition. Exclusive territory. Free samples. Express Co., 408 Illinois St., St. Louis, Mo.

SALESMEN, learn true art of salesmanship, gist of experience in great international corporation, \$1.00, refunded if dissatisfied. No refund not requested. Hoer & Co., 609 W. 138th, N. Y.

DON'T fail to read page 263, advertising section.

SALESMEN—We have some excellent territory open to salesmen of ability. This is a proposition that appeals to the best class of executives. Sales are easy and your profits large. Write us today for catalog P. M., covering the Schick All-Steel Paper Hair. Daventoff Mfg. Company, Des Moines, Iowa.

WANTED—Distributors, Men and Women—to give away free pkgs. Perfumed Borax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 218 Institute, Chicago.

HELP WANTED

MEN between 18 and 25 wanted, \$75.00 month. Government Railway Mail Clerks. Examinations likely announced everywhere Jan. 15th. Full description free. Franklin Institute, Dept. 0-21, Rochester, N. Y.

LEARN Automobile Repairing, driving on up-to-date cars; electrical, civil engineering; surveying; methods most practical; room and board while learning; many positions secured; satisfaction guaranteed; catalog free. National School of Engineering, 2110 W. 5th, Los Angeles.

RECOMMENCE detectives—Large salaries; nice work; experience unnecessary; write Superintendent Wagner, 1243 Lexington Avenue, New York.

I GUARANTEE \$10 for first photograph you write by my method. As former newspaper editor, I speak with authority. Send for free booklet, "How to Write Photographs." Albert Moore, Box 772, P. F., Chicago.

GET a civil service appointment. Work for Uncle Sam. Liberal pay. Steady job. We teach you how to secure appointment by mail. Write for free book, "The Easy Road"—It's free. Commercial Correspondence Schools, 264 Schools Bldg., Rochester, N. Y.

BE a Detective—Earn from \$150.00 to \$300.00 per month. Travel over the world. Write C. T. Ludwig, 340 Westmore Building, Kansas City, Mo.

WRITE Moving-Picture Plays, \$50 each. All or spare time. Correspondence course unnecessary. Details free. Atlas Publishing Co., 2045 Cincinnati, Ohio.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhes, Desk C. R., Omaha, Neb.

WANTED—An Idea! Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write for "Patent Intentions" and "How to Get Your Patent and Your Money." Randolph & Co., Patent Attorneys, Dept. 114, Washington, D. C.

THOUSANDS Government Jobs Open to Men and Women. \$65.00 to \$150.00 month. Write for list, Franklin Institute, Dept. 0-21, Rochester, N. Y.

GOVERNMENT Examinations. Most thorough preparation, \$5; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

GO on the Stage. Vaudeville career offered you. Experience unnecessary. Managers endorse my method. Instructive vaudeville book free. Write today. Fredrick LaDelle, Box 10, Jackson, Mich.

WRITE moving picture plays, \$25 to \$100. Experience, correspondence course unnecessary. We help revise, sell. 40 companies here. Free information. Photoplay Bureau, 225 "C," Los Angeles, Calif.

WE spent \$1.65; made \$27.30. Easy, after supper; no canvassing; opportunity. Complete directions 25c. Listing Co., Atlanta, Ga.

ANYONE can earn \$25 weekly silvering mirrors; no capital. Write Wallace Ahrli, Lima, Ohio.

RAILWAY Mail Clerk Examinations everywhere soon. Commence \$75.00 month. Sample questions free. Write Franklin Institute, Dept. 0-21, Rochester, N. Y.

FREE Illustrated Book tells of about 200,000 protected positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet 8-29. No obligation. Earl Hopkins, Washington, D. C.

PLEASANT spare-time work: mailing circulars. Good pay. No scheme. Details free. Home Pub. Society, 46 N. 12th, Philadelphia, Pa.

SPEND money gathering butterflies, insects. I pay highest cash prices. Instructions. Send stamp. Blackie, D. S., Los Angeles, Cal.

OWN a business. Co-operate with me evenings at home. Everything furnished. Don't worry about capital. Boyd H. Brown, Dept. K-2, Omaha, Neb.

POSITIONS—High as \$1,500 and \$1,000 open to persons trained by us in special lettering and map drafting; rent apartments. Particulars and booklet, "Topographic Drafting," on request. Columbia School of Drafting, Penikese and G. Washington.

LEARN Tartaric Mirror-Silvering—It pays! Long, closely guarded secret of big factories. Particulars free. Wm. Barston, 514 23rd Street, Oakland, Calif.

GET a Government Job! See ad on page 12. Write now—today! Patterson Civil Service School, Rochester, N. Y.

RAILWAY Mail Clerks Wanted. Commence \$75.00 month. Sample examination questions free. Franklin Institute, Dept. 0-21, Rochester, N. Y.

YOUNG Man! Learn Drafting—one of the most practical subjects of study today—indispensable in many occupations—engage in individual study successfully with the aid of our new book, "A Practical Course in Mechanical Drawing," 160 pages, 157 drawings, cloth, 50 cents, postpaid. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

BECOME Chauffeurs, \$18.00 week. Earn while learning. Sample lessons free. Franklin Institute, Dept. O-803, Rochester, N. Y.

BE a detective. Earn big money. Write John J. Gillies, Licensed and Bonded N. Y. State Detective. Retired Member N. Y. Police Dept., 22 years experience. 251 Huguenot St., New Rochelle, N. Y. Investigation solicited.

WANTED—Distributors, Men and Women—to give away free pkgs. Perfumed Borax Soap Powders; no money or experience needed; good pay. S. Ward & Company, 213 Institute, Chicago.

EARN \$500.00 annually; commercial information wanted; spare time; confidential; exceptional opportunity for stamp. "Cleo," P.M.C., Peru, Indiana.

WE want young men everywhere with some natural mechanical ability to take up a new and rapid method of doing an old-established line of work always in demand. Average pay—\$1.00 for every hour's work. Address: Ross System, 201 Lincoln Jan Court, Cincinnati, O.

IF you desire to better your present position, send 25 cents for book "Positive Ways To Secure the Position You Desire," to J. Johnson, 162 E. 32nd St., Brooklyn, N. Y.

BRANCH managers wanted for nationwide Mail Order Business. Work in spare time. Experience unnecessary. You should make \$50 weekly. Am. Sales Co., Dept. 34, Chattanooga, Tenn.

WANTED—Distributors of advertising matter everywhere. Send for Application Contract, Sample Magazine (free first). Hackley's Distributing Agency, 4601 Blairville, Pennsylvania.

OUR Table gives 100 companies wanting short stories, poems, photographs. Tells kind each wants. A key to success. Postpaid \$1. Money back if dissatisfied. Gordon Publishing Co., 8043, Cincinnati, Ohio.

MEN and Women Wanted, \$45 to \$150 month. Government life jobs. Common education sufficient. Thousands vacancies yearly. Write immediately for list of positions and examination schedule. Franklin Institute, Dept. O-21, Rochester, N. Y.

WE have several openings for establishment of independent mail-order business. Energy, good habits and sound judgment more important than capital. Spare time at first. Particulars free. Opportunities Exchange, Buffalo, N. Y.

DON'T fail to read page 185, advertising section.

A MONEY Proposition—Co-operate with me in a profit-sharing mail-order business. Will place trial advertisement. furnish printed matter, goods to fill orders and divide the profits. Particulars, Desk 353, Hazen A. Horton, Tekonsha, Mich.

I HAVE a contract to distribute a million free packages of Borax Soap Powder. Want reliable men and women to help. Chance to earn good pay. E. Warrick Brown, 734 N. Franklin St., Chicago.

SILVERING Mirrors and Auto-reflections. Plating tableware home. Plans free. Clarence Sprinkle, East Grant, Marion, Ind.

THOUSANDS Government Jobs Obtainable. List free. Write Franklin Institute, Dept. O-21, Rochester, N. Y.

FIREMEN, Brakemen, all Railroads, \$150. Experience unnecessary. Send age, postage. Railway Association, Dept. 298, Brooklyn, N. Y.

CASH quick. Our Free Booklet Number Ten gives Magic Secrets of Success. Stephens School, Muncie, Indiana.

BE a Detective. Earn \$150 to \$300 monthly. Travel over the world. Write American School of Criminology, Dept. P, Detroit, Michigan.

WANTED

HIGH grade gas-welding plant, standard lathe, air compressor, alternating current motor. Must be bargain. Box 258, Eugene, Ore.

WANTED, by Mail Order concern, novelties of every description. Address, P. O. Box 558, So. Norwalk, Ct.

FOR SALE

FIELD Marine Day and Night Glasses with beautiful case, 25 sold adjustment, \$30.00 value, only \$0.50. Money back if not satisfied. Ye Curiosity Shop, 20 S. Second St., Philadelphia, Pa.

VACUUM cleaner pumps and parts for assembling, also 15¢. Vacuum Supply Co., Ann Arbor, Mich.

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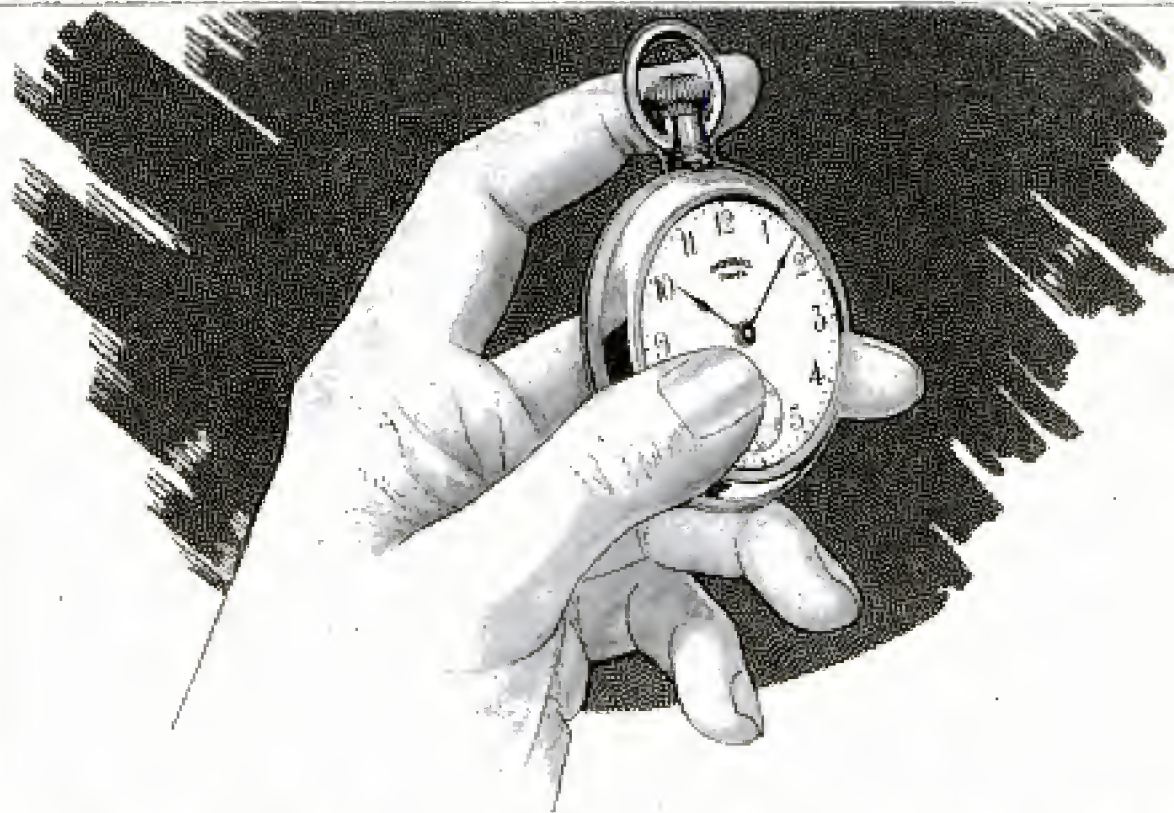
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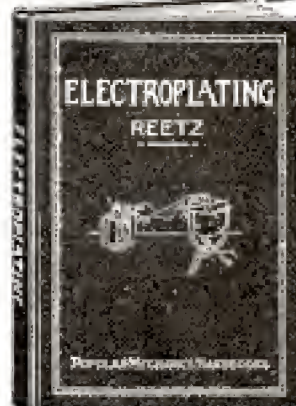
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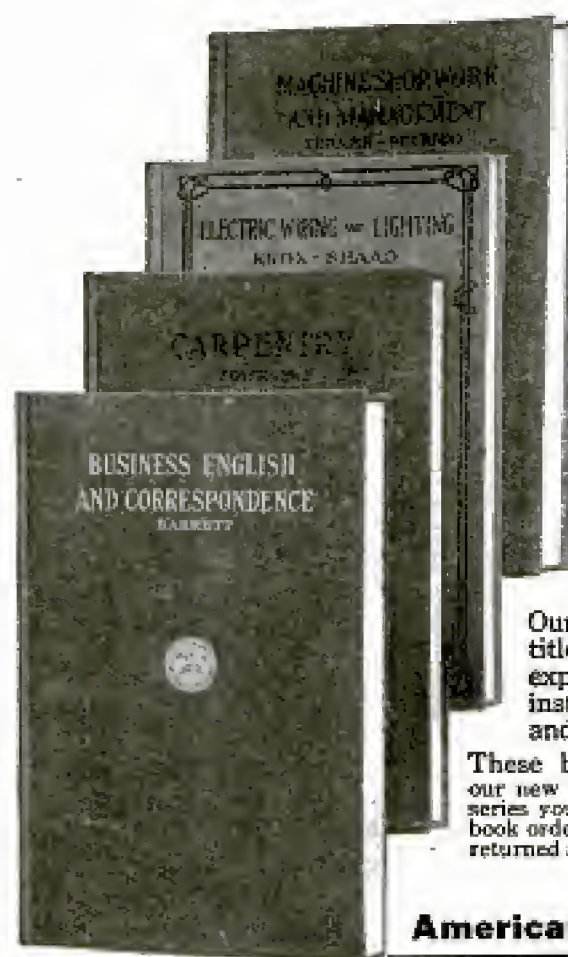
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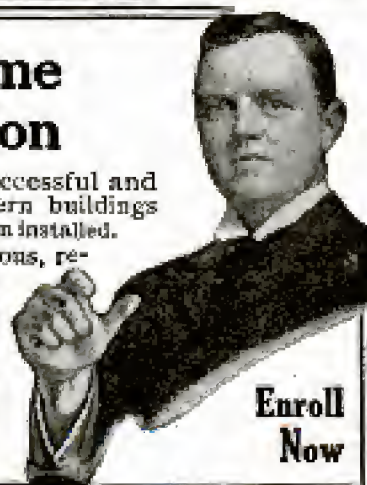
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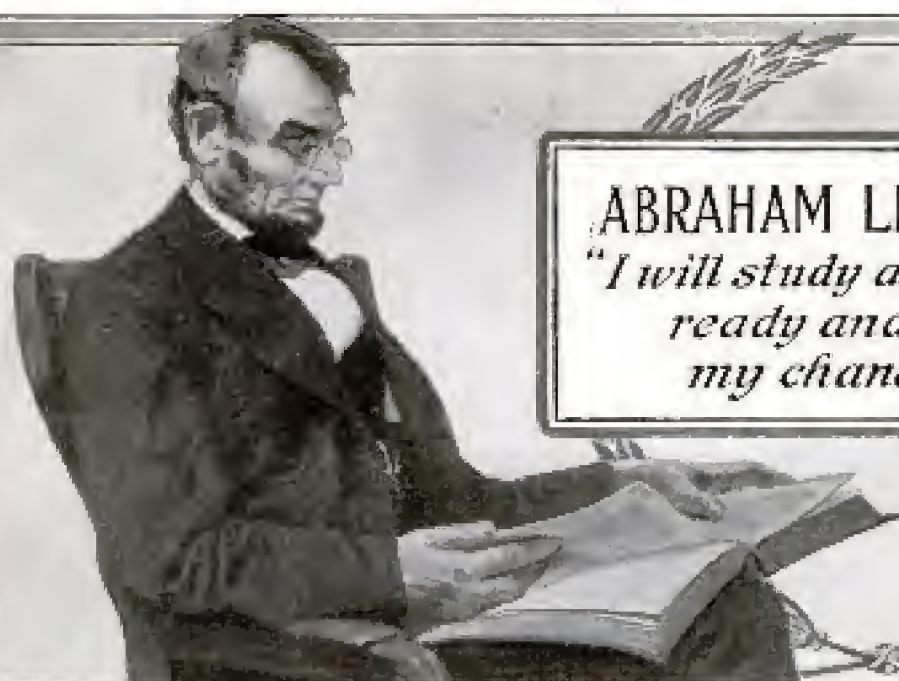
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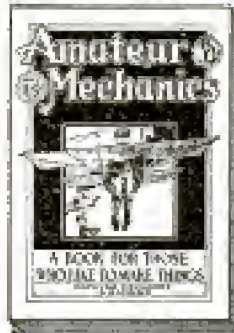
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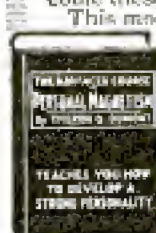
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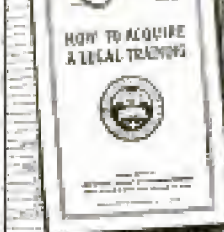


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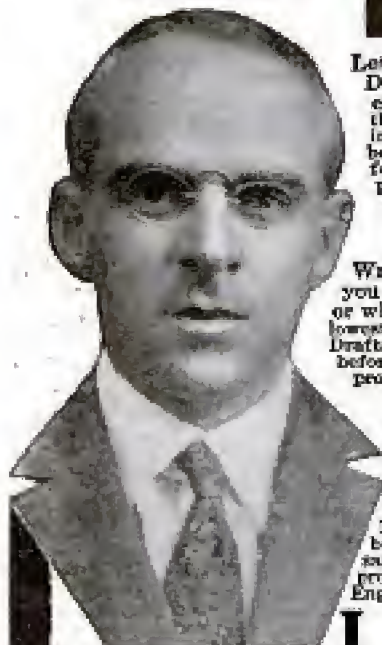
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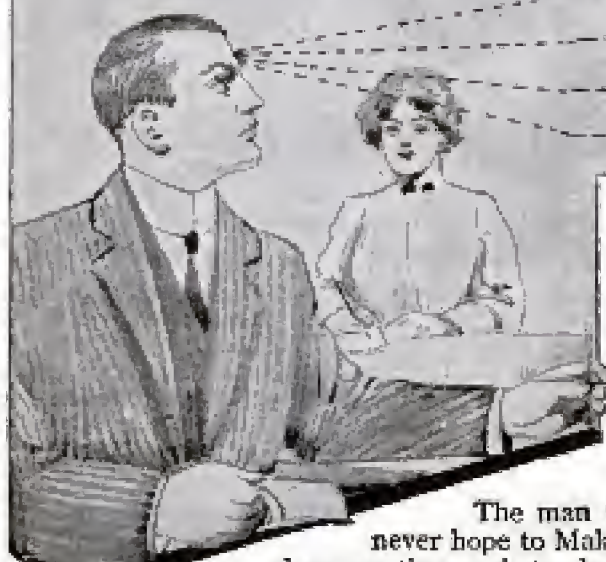
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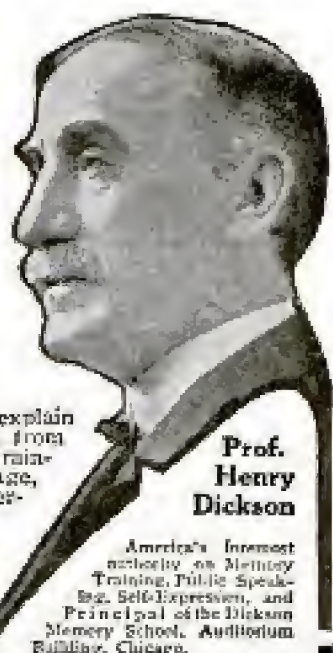
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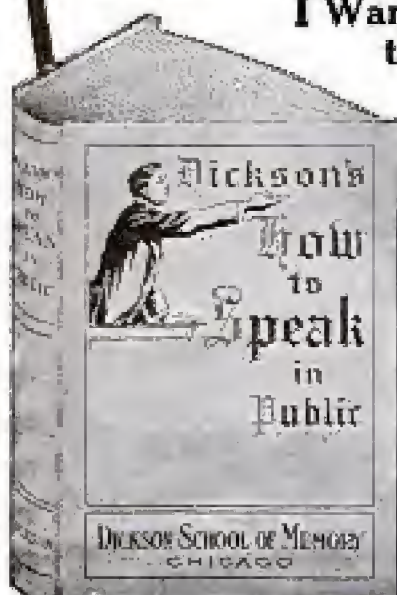
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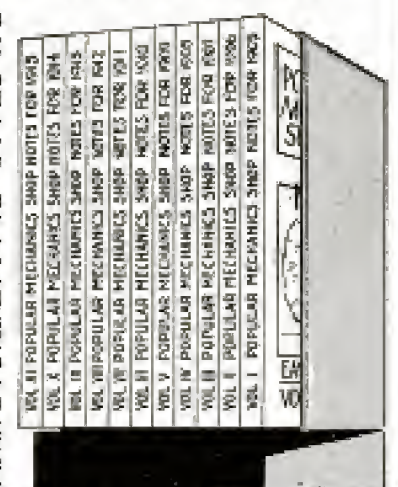
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Vol. 23

82354

FEBRUARY, 1915

No. 2

Illustrated London News

Oddly Mounted Gun Used for Fortress Defense

ONE of the machine guns which has been used with success by both the Belgian and French armies during the present hostilities, is supplied with a parapet mounting which adapts it particularly for fortress defense. The gun itself is similar to many used in aeroplane service, but its mounting in this instance fits it for use behind ramparts and entrenchments in defensive action, and even in scaling walls and breastworks of the enemy during offensive operations. The instrument has an angular mounting on a geared shaft, the lower end of which has a wheel-and-brace mounting, while the upper end is supplied with arms that hold it in place at the top of an embankment. When the pole is raised for use, the gun and its platform, which carries the ammunition box, is drawn up to firing position by a hand crank. It is then possible for



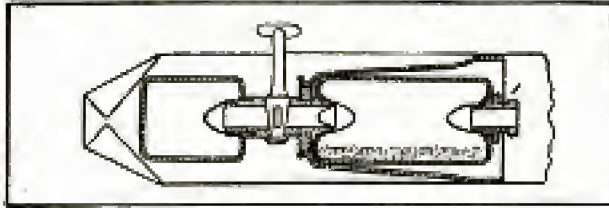
Machine Gun Used by the Allies for Fortress Defense and Even for Offensive Operations

the gunner to sweep the field before him while being sheltered behind the rampart. The gun is manufactured by a firm which was originated in France by an American.

LIFE BELT INFLATED BY CONTACT WITH WATER

The ordinary life belt is a cumbersome thing to wear, and in order to provide protection for airmen or others

THE GOBBY LIFE BELT



This Life Belt becomes Inflated Automatically When the Wearer is Thrown into the Water

who are likely to be thrown into the water a life belt has been invented that lies flat about the chest under ordinary conditions and becomes inflated when brought in contact with the water. This belt consists of a flexible tubular girdle, at one end of which are two receptacles, one containing water and the other a carbide which becomes a gas and inflates the tube when mixed with water. A valve permits the wearer to let the

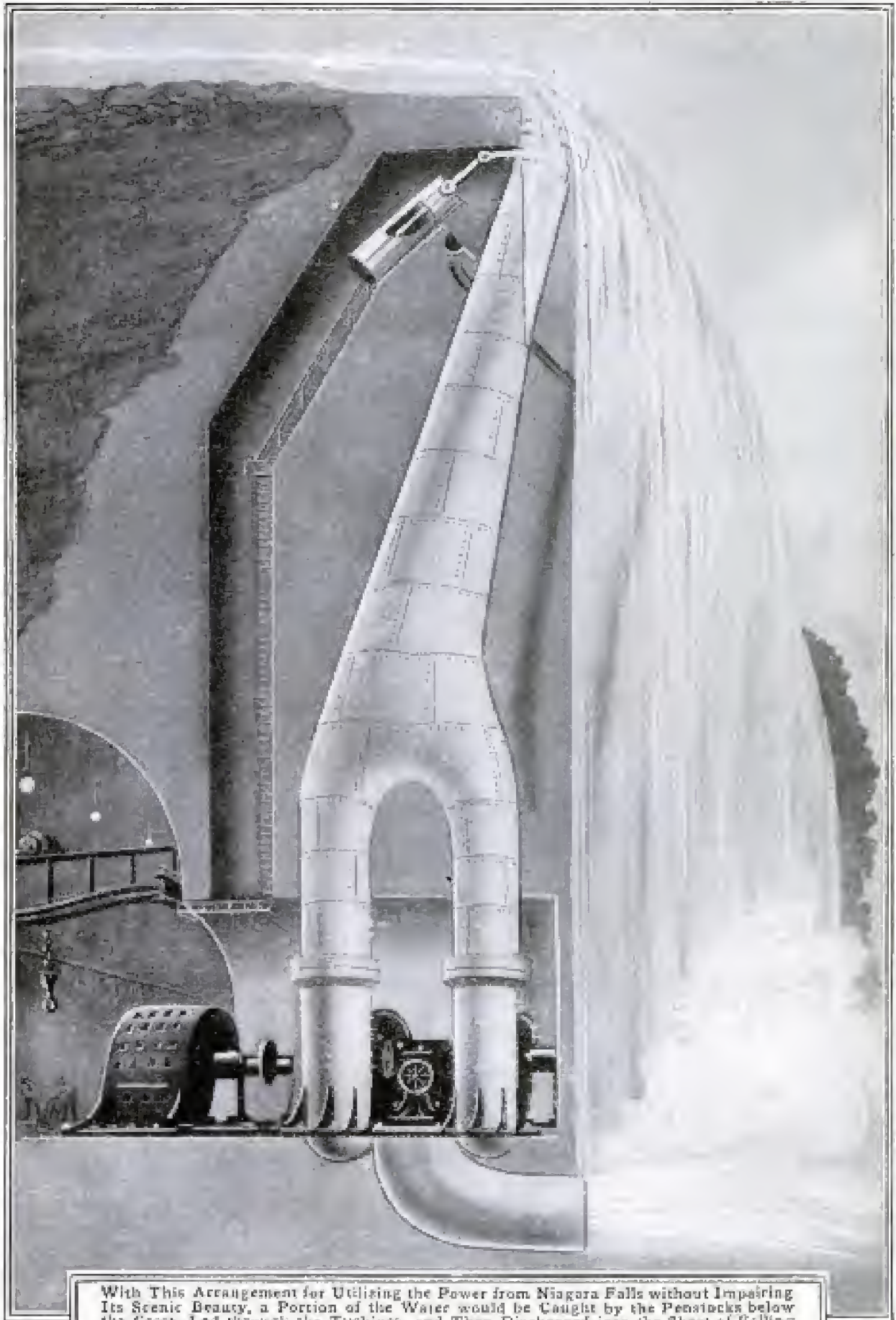
water into the carbide receptacle, while a wick that passes from the outside of the belt into this receptacle causes the water to enter and inflate the tube automatically in case the wearer is unconscious after being thrown into the water. Provision is made for preventing the entrance of water after inflation has taken place and for preventing overinflation of the tube.

NOVEL PLAN FOR UTILIZING POWER OF NIAGARA FALLS

A plan for saving and utilizing from 75 to 80 per cent of the power now going to waste over Niagara Falls without diminishing the scenic beauty of the falls has been worked out in detail and is being promoted. Two of the most important features of the falls, in a scenic way, are the deflection of light through the water as it curves over the crest, and the rising spray from the impact of the water at the base of the cliff, and both of these features are to be preserved. This is accomplished by an ingenious arrangement of penstocks by which a portion of the water is caught as it falls from the crest, is led through the turbines, and is then discharged into the falling sheet of water at the foot of the cliff, care being taken not to divert enough of the water through the penstocks to impair the beauty of the falling sheet. The plan involves the building of a permanent concrete crest for the falls, to prevent future erosion, as well as the construction of a tunnel across the river back of the face of the cliff. To divert the water from successive sections so that this work can be done, dams are to be made by building cribs in the river above the falls, and then floating them down to a point near the crest and sinking them. After the work is completed, these dams are to be removed by blasting, or by unloading the cribs and floating them to a new site.

Valuable platinum deposits have been discovered in ore from the Yellow Pine mining district in Nevada.

*J. S. Harvey, Menaggio, Italy
Clipping taken from "The
Aeroplane" Aug. 1913 to Inven*



With This Arrangement for Utilising the Power from Niagara Falls without Impairing Its Scenic Beauty, a Portion of the Water would be Caught by the Penstocks below the Crest, Led through the Turbines, and Then Discharged into the Sheet of Falling Water at the Foot of the Cliff

Wm. H. Watson, Norton, Pa.
Box 206

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POPULAR MECHANICS

AUTOMOBILE CLIMBS SLOPE

OF FORTY-FIVE DEGREES

8676 m An automobile carrying five passengers performed a remarkable feat recently by climbing up a slope having



Automobile Breaking the Record for Hill Climbing

an angle of more than 45°. The car attained a position about two feet higher up the slope than that shown in the illustration, but could not hold the position on account of the dirt slipping out from under the hind wheels. This climb was made by a standard car equipped with friction drive.

As a result of the efforts of the Federal government to stamp out foot and mouth disease among cattle, American glassware manufacturers find a serious shortage in the supply of hay and straw used in packing their products, since these products are also quarantined.

The Japan Magazine
HOW PAPER IS MADE FROM

MULBERRY BARK

8677 m The making of paper from the bark of the kozo shrub, or paper mulberry, is one of the oldest industries in Japan,

being so old that it forms a part of some of the ancient Buddhist myths of that country. The process of making this, the "hashikirazu" paper, is simple in the extreme, but results in a high grade of paper having remarkable strength in the direction of the fiber. The bark is first cut into lengths of two or three feet, and is boiled in a caldron until the coarse parts of the bark can be removed. The remaining fiber is then beaten to a pulp in a mortar while it is mixed with juice from hollyhock roots. The pulp is next put into a box having a sieve bottom made of bamboo, and all the water is drained off, after which it is spread over a board to the thinness of paper and left to dry and harden. The side next to the board has the smoother

surface and becomes the face of the paper. This paper can be used for a great variety of purposes, the latest being that of making paper boats, the process for which was described in the January, 1915, number of this magazine.

UNIVERSITY STUDENTS SET OFF BIG BONFIRE

8678 m A bonfire produced by burning up a carefully built wooden structure, 30 ft. square and 50 ft. high, was the principal feature of a football rally at Stanford University, California. This pyre,

*Geo. W. Fenimore, 204 University Ave.,
Salo Alto, Calif.*

which cost about \$100 besides the work of 400 students for several weeks, was built to represent the campanile of the rival University of California, and the resulting bonfire was intended as an amiable expression of intercollegiate feeling. In order to provide a sufficient

evening of the rally the pyre was drenched with crude oil and kerosene, and then set off by means of a long



The Stanford University Bonfire as It Appeared Ready to Light



As It Appeared after being Soaked in Oil and Set on Fire by a Fuse

draft for the fire, a flue, 6 ft. square, was constructed in the center. On the

fuse. It was burned to the ground in less than 30 minutes.

3852 H

Sh. over

RADIO GONE, SHIP SIGNALS RESCUERS WITH LIGHTS

Lashed to a mast of the ill-fated steamer "Hanalei," which struck the Duxburg Reef, off San Francisco, during a recent storm, a wireless operator for nearly 12 hours after the vessel's radio equipment became disabled directed the rescue work of life-savers ashore by flashing messages in the Morse code by means of an electric torch. The tragedy was one of the saddest that has occurred on the Pacific coast in years. Although within 500 ft. of land, more than 20 of the 63 persons aboard the ship lost their lives. The vessel went on the rocks in a fog

about the middle of the day, but it was night before mortars could be procured for firing life lines. It was then that the operator, by flashing dots and dashes with the electric light, informed the rescuers where the lines were falling and how to shoot the next ones, although all this was in vain. In turn, messages of cheer were sent out from the shore with a motor-car headlight.

Each time after the mortar boomed and the line shot out into the dark, there was a suspense. Then the light high on the ship's mast would commence blinking. "Windward and too

*Arch Macdonald, 280 Lee St., Oakland, Cal.
photos - Inter. News Service, San Francisco Chron.
Los Angeles Tribune - Letter from Dept. of Commerce*



For Hours the Wireless Operator of the Ill-Fated "Hanalet" Directed the Rescue Work of Life-Savers by Blinking Out Messages in Dots and Dashes with a Flashlight

low. Send her higher," would come the message. Then another shot would ring out, followed by another message. This continued throughout the night. Before dawn on the following morning the ship broke in two and its passengers and crew were set adrift on the wreckage. A short time after this the revenue cutter "McCulloch" succeeded in picking its way through the debris and reaching some of the half-drowned survivors. Others were reached by life-savers—some of whom gave up their own lives in the strug-



This Remarkable Photograph of Life-Savers Actually at Work Shows the Rescue Party Taking Some of the

gle—and a few drifted ashore on the timbers.

The last bomb, the only one that went true, was fired at two pieces of wreckage in line with each other, to which a large number of the passengers were clinging. This was just at day-break. When the line was fastened, the wreckage was drawn within 100 ft. of the shore. The Secretary of Commerce of the United States sent a personal letter of thanks to L. A. Lovejoy, the "Hanalei's" wireless operator, for his courage and ingenuity, measuring up to the high standards of the wireless service.

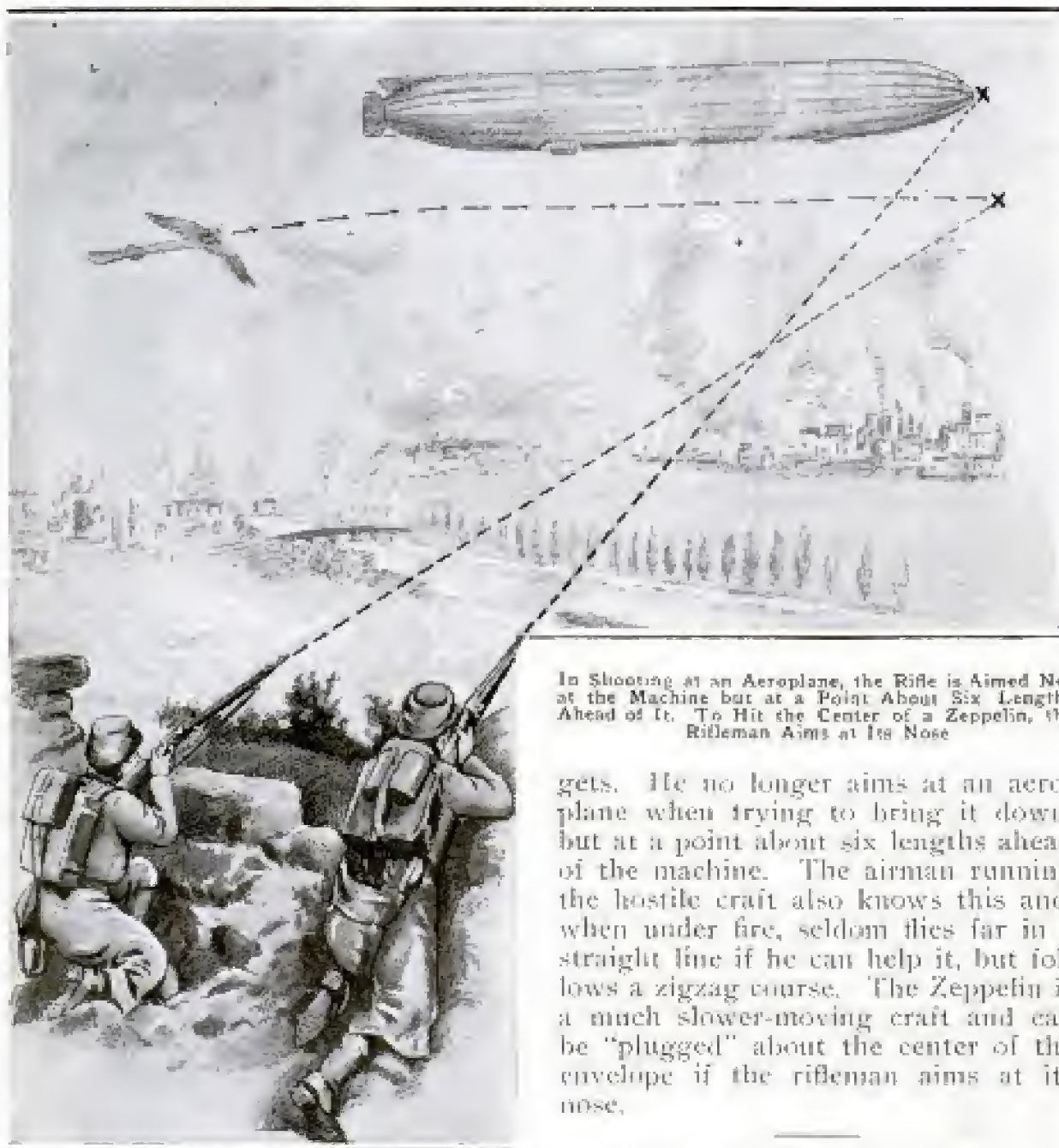


Those
Ashore,
Vainly Try-
ing to Shoot
Out a Life Line
through the Darkness,
Sent Words of Cheer
to the Sinking Ship by

Flashing Messages in the Morse Code with Motor-Car Lights



Half-Drowned Survivors from a Small Piece of Wreckage Which was Pulled Ashore by Means of a Life Line



In Shooting at an Aeroplane, the Rifle is Aimed Not at the Machine but at a Point About Six Lengths Ahead of It. To Hit the Center of a Zeppelin, the Rifleman Aims at Its Nose

gets. He no longer aims at an aeroplane when trying to bring it down, but at a point about six lengths ahead of the machine. The airman running the hostile craft also knows this and, when under fire, seldom flies far in a straight line if he can help it, but follows a zigzag course. The Zeppelin is a much slower-moving craft and can be "plugged" about the center of the envelope if the rifleman aims at its nose.

HOW TO SHOOT AN AIRSHIP OR AEROPLANE

The advent of the aeroplane and the airship has introduced a hard problem for the rifleman, whose duty it is to bring down hostile craft of this kind. Even with its enormous speed the bullet discharged by a modern rifle is not fast enough for the aeroplane, as has been discovered in the European war, but the expert riflemen who are constantly on the watch for hostile air craft are fast learning the requirements for hitting these swiftly moving tar-

ORGANIC BASE STABILIZES SMOKELESS POWDER

In manufacturing smokeless powder for use in the navy, a stabilizing powder is now being incorporated in it to prevent its decomposition so that it may be kept in perfect condition for indefinite periods of time. The process consists of using an alkaline organic substance, which immediately neutralizes any acid that may be liberated, and which otherwise would tend to decompose the explosive. Previously no means of indefinitely preventing the powder from decomposition and pos-

your. U.S. Artillery p. 243

Refer to J. E. Lee, 107-28 St., Milwaukee, Wis.

R. F. Downey, 391 Pryor Ave., 169 Milwaukee, Wis.
POPULAR MECHANICS,

sible spontaneous combustion was known, but to safeguard against these dangers a special coloring matter was incorporated in the powder, which gave it a brilliant red color that faded entirely away the moment decomposition commenced, thus serving as a stability indicator. This finally was abandoned because of the fact that the different plants making powder for the government were not able to produce a uniform color. Subsequently the new stabilizing process was discovered and put in use.

EGG CARRIER FOR SHIPPING BY PARCEL POST

An essential feature of the farm-to-consumer movement is a container in which eggs in small quantities can be shipped by parcel post, or in any other way, without danger of breakage. What is said to be the only container adapted to the mail pouch has just been invented and placed on the market. The holder for the eggs consists of two circular end pieces spaced apart by heavy wires that have loops for suspending the eggs. The eggs are twisted singly in heavy paper and secured to the loops as shown. The result



With This Carrier
Each Egg is
Suspended in a
Kind of Hammock
and Does Not
Touch Any
Other Egg



is that each is carried in a kind of hammock and does not bear against any other egg. When the holder is filled it is inclosed in a solid case and is ready for shipment.

SINGLE-RUNNER SLED IS A COASTING NOVELTY

With surprising ability for maintaining equilibrium, a one-runner sled has been patented, which, it is said, is *Pat. 1,026,023 - May 14, 1912*
Magdalen Sierier and Charles Fredolin Urban, Milwaukee, Wis.



"Urban Mono-Runner"

A One-Runner Sled Which Attains Great Speed

able to develop a greater speed than the usual coasting device. In shape it is roughly triangular with curved ends. The seat is supported by mountings braced against the running bar, while a foot rest is provided near the vertex of the angle. Owing to the fact that there is less resistance with one runner than with two, speed is gained quickly. The sled is able to take curves while racing at great velocity with almost the same ease as a motorcycle. The posture of the rider is similar to that of a cyclist.

The plans for land defenses in the Canal Zone contemplate the construction of field works in certain localities. In front of these the land will be cleared sufficiently to cover the range of musket fire. Trails will be built connecting the land defenses with each other.

*Inter. News Service
200 Williams St., N.Y.C.*

Made by the Hammock Carrier Corp., N.Y.

MAKING OUR MILITARY AIR FORCES

8612 H

THE SECRETARY OF WAR SAYS:

THE immediate plans of the War Department contemplate the training of sixty officers and two hundred and sixty enlisted men added to the aviation section of the Signal Corps; the organization and equipment of the aero squadrons that the above-mentioned officers and men will supply; the establishment of aviation centers for their stations; the permanent establishment of the Signal Corps Aviation School at present located near San Diego, California; the establishment of an experimental laboratory and shops for the development of new types of machines, and the creation of a reserve for the personnel of the flying corps.

"Its future plans will depend upon the results obtained from carrying out the above projects and the lessons of experience taught by the present war in Europe. In order to carry into effect the plans now on foot, it will be necessary to have adequate appropriations and it is felt that Congress will always be ready to vote such sums as may be necessary. The subject of lighter-than-air machines is being given careful study, and the department's projects will be carried out when occasion demands. It is the intention of the department to develop the aeronautic arm of the service to an extent commensurate with the needs of the army, and it bespeaks for its projects the interest and support of the public.

"In considering this whole question of aviation in connection with the army, it should constantly be kept in mind that material without trained personnel is worse than useless. If we were to ask and receive appropriations for more material than we could usefully man, we would not be acting the part of wisdom. Our purpose is to train personnel as rapidly as possible, consistent with safety, and to ask Congress from time to time for appropriations for as much material as we can properly handle."

—Lindley M. Garrison, Secretary of War.

IN view of the renewed public interest in aviation due to recent military developments in Europe, this magazine undertook to ascertain exactly the conditions that exist in our own army and navy regarding aviation, and with the coöperation of the Secretary of War and the Secretary of the Navy is able to present here for the first time a complete and comprehensive statement of just what the situation is, just what developments are under way, and just what plans the officers in charge of this work in both arms of the service have for the future.

The United States Army now has 11 aeroplanes. All of these are biplanes, the oldest of which was delivered in January, 1913, and the newest, Sept. 21, 1914. Reliance has been placed solely in this type of machine because of the belief that it is superior to the monoplane for war purposes, a decision the wisdom of which, it is now considered, is being proved by current events. The "pusher" type of craft has recently been abandoned in favor of the tractor, which will be the design of machines hereafter purchased for this arm of the service. None of the

biplanes is equipped with either wireless or guns, although this could be easily done. Various stabilizing devices are being experimented with, but so far no army aeroplane has been fitted with such an apparatus. Tests have been made with several bomb-dropping devices and at least one has been adopted. The same is likewise true of guns designed for defensive work against air craft, while none of the troops has been equipped with them.

Thirty-five officers of the army have qualified as military aeroplane pilots. No enlisted men have so qualified, although eight are under instruction. So far, five hangars, or military aero stations, have been established by the War Department. These are located at San Antonio, Texas; San Diego, Cal.; Fort Kamehameha, H. I.; Manila, P. I., and Fort Leavenworth, Kan. Since aviation was instituted in the army in 1908, 13 army airmen have been killed in accidents. During the same period experiments have been conducted with dirigibles, and military authorities announce that these will be continued in the future. This form of craft, however, is not looked upon with a great

*J. C. McCarthey got signed statements
from secretaries*

ADEQUATE FOR THE NATION'S NEEDS

THE SECRETARY OF THE NAVY SAYS:

"WHILE an American discovered the principle of flying heavier-than-air machines and demonstrated the success of aviation, our own country has not made the progress of some European countries in utilizing the fruits of this marvelous invention. I have urged upon Congress the importance of providing an adequate aeronautical division for the navy. An aeronautic station and flying school for officers and men has been established at Pensacola, and the 'North Carolina' has been designated the aeronautic ship of the navy. We are but on the threshold of the development and utilization of air craft, and their steady increase on a large scale is a fixed policy of the department.

"The department contemplates the purchase at an early date of two small dirigibles for experimental purposes and 32 aeroplanes from American manufacturers. It is to be regretted that conditions in Europe have made it impossible to obtain foreign-built aeroplanes to study their construction and equipment. The best types of American makes have been ordered, but home manufacturers have not been able to supply the navy's demand for air craft of the most approved design. They have confined their efforts almost entirely to machines for land flying and have not completely developed the manufacture of hydro-aeroplanes.

"It has always been the policy of this country to put great dependence on its militia, and it is most gratifying to the department to be able to accept the offers from a large number of skilled private aviators who have volunteered their services in case of necessity."

—Josephus Daniels, Secretary of the Navy.

deal of confidence by army authorities. The chief signal officer declares that it is doubtful whether the dirigible is worth its cost for offensive operations, while for reconnaissance or defense it is apparently of much less value than the aeroplane. Its value as an observation station is considered great under circumstances which prevent its destruction by the fire of the enemy, or by hostile aeroplanes. The general feeling, though, is that the dirigible requires so many favorable conditions for valuable operation that its worth for land operations, in comparison to its cost, is questionable.

"Why," it is often asked, "does not the War Department organize an aeroplane militia, or at least make arrangements for the use of the scores of privately owned aeroplanes in case of war?" The army's reply is emphatic and interesting. According to the officers who have studied the subject, the majority of privately owned machines are nothing more than toys, and dangerous ones at that. The lack of sufficient lifting power, speed, and stability renders them unsuitable for military purposes. It is therefore up to the

army to develop its own air craft. Private manufacturers are not building machines suitable for military purposes. When the United States Army last summer announced an offer of prizes totaling \$30,000 to manufacturers who would develop, according to set specifications, biplanes suitable for military purposes, only one machine meeting the requirements was submitted.

This, briefly, is the status of America's preparedness for aerial warfare so far as the army is concerned. As compared with the aeronautical establishments of the great military powers of the world, this country's condition might be considered by the lay mind pitiable as well as alarming. Great Britain has, according to the latest figures in the hands of the Navy Department, 900 aeroplanes and 12 dirigibles; France, 1,400 aeroplanes, 30 dirigibles; Germany, 1,400 aeroplanes, 60 dirigibles; Russia, 1,000 aeroplanes, 2 dirigibles; Austria-Hungary, 600 aeroplanes, 8 dirigibles; Italy, 300 aeroplanes, 4 dirigibles; Belgium, 60 aeroplanes, no dirigibles; and Japan, 20 aeroplanes and 2 dirigibles. In considering the difference in the conditions



Some of the Officers and Men of the Newly Organized Aviation Section of the United States Army
Where Government's New

bearing upon the development of this branch of our army with those in the armies of Europe, however, the progress has been greater than is apparent. The organization of an aerial service by the War Department could not be undertaken without enabling legislation and appropriations by Congress. Until July 18, 1914, no such authority was given. At that time, however, an act was approved which increased the army by 6 officers and 260 men for aviation. Under this new law developments have been rapid.

The army aviation section is a part of the signal corps, to which is assigned the duty of training officers and enlisted men for the service. With certain exceptions, aviation officers are selected from among those holding commissions below that of captain. They are rated in two classes, "military aviators" and "junior military aviators," and all men on aviation service receive increased pay.

Before such men qualify for these positions, however, they must pass severe examinations. These are made to show their fitness not only as airmen, but also their understanding of meteorology and topography. They must know how to take care of their machines, how to dismantle and assemble motors, and also show a thorough knowledge of all engines in use at the stations at which they are detailed. The tests to which they have been subjected in the past have been much more difficult than those made by the Aero Club of America before granting a pilot's license. Despite this,

however, new and even more difficult requirements are being prepared at the present time.

The formation outlined for the first aerial squadron of the United States Army consists of a squadron headquarters and two companies. The commissioned personnel of the headquarters consists of a major, commanding the squadron, and a captain or lieutenant. Each aero company is commanded by a captain, while there are eight other commissioned officers ranking from lieutenants to captains. The total formation consists of 20 officers, 90 men, 8 aeroplanes, 16 motor trucks, and 6 motorcycles. As yet the organization of this squadron has not been completed. The plans of the War Department contemplate equipping it fully, first, and then making further developments as rapidly as appropriations will permit. For doing this, the army has at the present time the unexpended balance of an appropriation of \$250,000 allowed by Congress for the fiscal year ending June 30, 1915.

There are 15 aeroplanes in the aerial service of the navy. All of these are biplanes, the oldest of which was purchased four years ago, and the newest, the new Burgess-Dunne tractor, acquired late last fall. None of these machines is fitted with guns, but provisions have been made for thus equipping them in the event of necessity. A special gun for this purpose is now being developed. Wireless apparatus, although not regularly installed, is now being experimented with. The same is essentially true concerning stabilizing



States Army Photographed at the Military Aero Station near San Diego, California.
Air Craft are Tried Out

devices. What is termed a very good type of gun for attacking air craft has been developed and proved successful in tests made against aerial targets. There are 16 officers who have qualified as fliers, but, as in the army, no enlisted man has passed the tests admitting him to the service, although several of them are being instructed. Only two officers have been killed in aeroplane accidents. Experiments have been made with different kinds of bomb-dropping devices, but none has been adopted for regular use. The Navy Department in this connection states that the effectiveness of bombs thrown from an aeroplane is still a matter of doubt on account of the small amount of weight that such a craft is capable of carrying. The only naval aeronautic station is situated at Pensacola, Fla.

No experiments have been made with dirigibles. The navy, however, is now in the market for at least two such craft of minimum displacements of 75,000 cu. ft. American manufacturers have been asked to submit plans, specifications, and estimates on balloons of the general type of the Parseval, Astra-Torres, or other European dirigibles of the nonrigid type, to be built in this country. For naval purposes this type is preferred to the Zeppelin, or rigid, style. These airships are intended to be used in training American seamen in this phase of aerial navigation, and for general experiments. The department has funds available for the immediate purchase of such machines and is willing to enter

into any reasonable plan to assist domestic companies to supply its wants.

Like the army, the navy has received very little help from American manufacturers in developing aeroplanes suitable for war purposes in its arm of the service. While it has been extremely difficult for the army to find aeroplanes meeting its requirements, it has been even more difficult for the navy. Nearly all flying boats so far produced in this country have been designed for use on inland waters and are not suited for sea service. Therefore, the navy, like the army, is now confronted with the task of developing its own machines.

What it will be able to do in carrying out its plans for the future depends entirely upon appropriations being made by Congress. There is now no specific appropriation available. There is an allowance, however, of about \$350,000, which has been made up from the various bureaus, available for acquiring and equipping air craft. The expenses for maintaining and repairing the machines already in service, however, must be borne also by this fund. The General Board of the Navy, of which Admiral Dewey is chairman, has recommended that an appropriation of \$5,000,000 be approved for the purchase of air craft for this arm of the service. With the money now on hand, it is hoped to purchase within a very short time 32 new machines. This depends entirely upon the ability of American manufacturers to develop a type of machine satisfactory for ordinary conditions at sea. The Navy De-

partment does not now contemplate manufacturing its own machines, although it is doing a great deal of experimental work at the Washington navy yard and at Pensacola, Fla. At the former place model machines are tested in an air tunnel to ascertain their characteristics of flight, while floats, or pontoons, are tested in a model basin. In this way valuable information is being collected with which it is expected that, within a short time, it will be possible to formulate specifications and invite American manufacturers to supply machines for the navy.

A reserve aviation corps for the navy has been organized on paper. Several private airmen have volunteered their services, and a list of these men is kept by the department. In case of war, this reserve corps could be put into service. A further plan has been drawn up, however, establishing an aerial service in the naval militia. All the men in this service will be drilled in the same course of instruction as is given the regular naval airmen and organized under the same regulations.

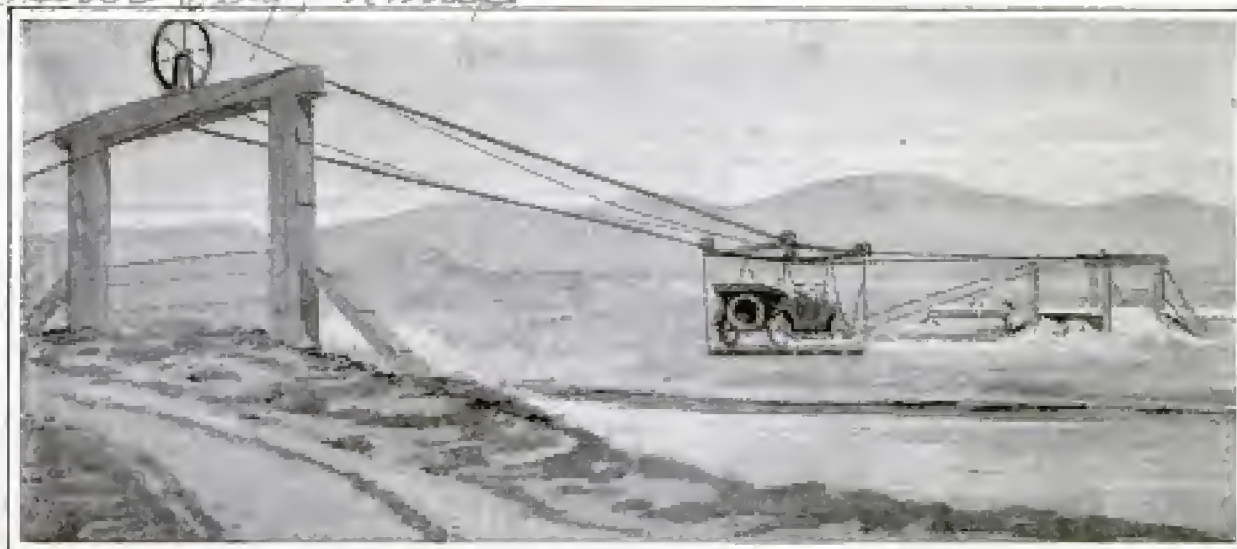
Congressional inactivity and the inability, or lack of enthusiasm, of American manufacturers of motors have been the main factors in hampering the development of military aviation in this country. It has seemed

almost hopeless to depend upon the United States to build adequate motors for aeroplane use. Because of this, it was necessary for both the army and navy to purchase motors abroad. While these have given excellent service, the signal corps now finds itself in the embarrassing position of being unable to obtain extra parts for these engines, on account of the conditions existing in Europe. It is equally difficult to have parts for foreign-made engines constructed in this country, since the metric system of measurement is used almost exclusively on the continent, while, of course, no new foreign-made engines can now be obtained. The chief signal officer of the army in his annual report asserts, however, that the present outlook for obtaining suitable motors here is more encouraging than it ever has been. It is stated that at least one American-made engine now will compare quite favorably with those produced in Europe. It is believed it will naturally follow that the increased demand for American motors, a thing now assured, will result in their further development, and that within the next year or two the aerial defenses of the United States, the parent nation of aviation, will be made sufficiently extensive and efficient for the country's needs.



The New Curtiss Military Tractor Biplane, the Only Machine That Came Up to the Army's Specifications in the San Diego Tests

Don W. Luak, % Inde-
pendent Pub. Co., 212
Yankie St.,
Silver City, N. Mex.



This Cableway, Built by a Farming Company across the Gila River in New Mexico, Is Capable of Carrying the Heaviest Motor Trucks

AERIAL TRAMWAY ACROSS 8808 GILA RIVER

An aerial cableway capable of carrying automobiles and the heaviest motor trucks has been built by a ranch company across the Gila River in New Mexico, a stream that is dangerous at all seasons of the year because of frequent floods and treacherous quick-sands. The cableway consists of two steel bands, each 670 ft. long, 5 in. wide, and $\frac{1}{2}$ in. thick, and having a breaking strength of 120,000 lb. The main span of the cableway, across the river, is 340 ft. The steel bands are spaced 8 ft. apart and are 14 ft. above the water. From these cables is suspended a platform, 18 ft. long, capable of carrying 20,000 lb. with safety. This platform is suspended by four flanged wheels, two of which run on each of the steel bands, and is propelled by an endless steel cable driven over a series of grooved wheels operated by a horse sweep. The time required for carrying a load across the river is approximately three minutes.

Speaking before a meeting of coal operators in England, an expert recently expressed the opinion that owing to the constant increase in the cost of mining, the days of cheap coal are past and can never return.

SIGNS REGULATE VEHICLES 8407 IN CITY STREETS

"Safety-first" traffic signs have been placed along the business thoroughfares of Los Angeles, Cal., on which



A "Safety-First" Sign in a Los Angeles Street

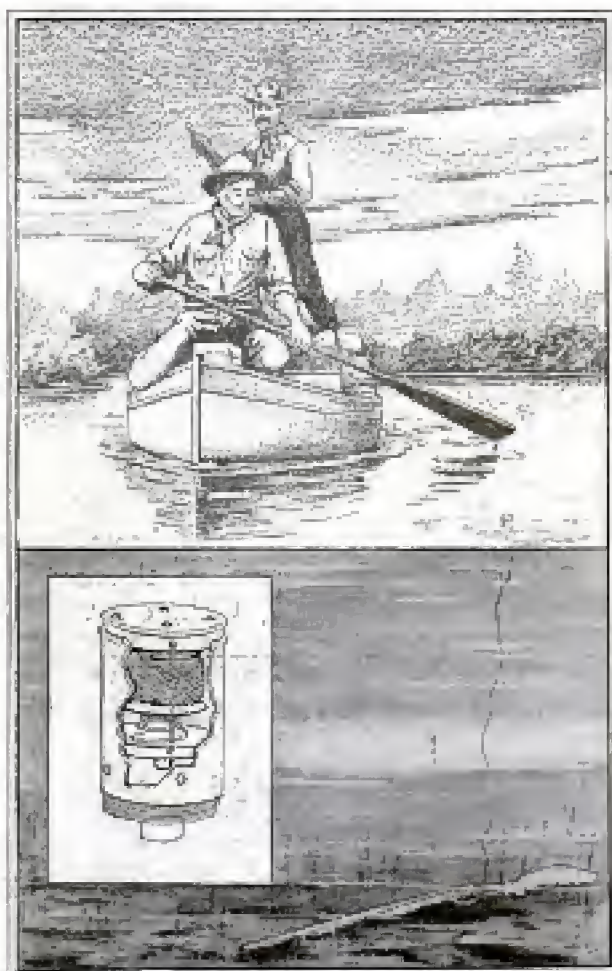
there are surface traction lines, in order to regulate motor cars and other vehicles at points where passengers are taken aboard and discharged by street cars. The signs are placed far enough from the street intersections so that they stand several feet back of a street car when it stops at a crossing. Vehicles are compelled by ordinance to remain in the rear of the signal as long as a car is stopped at a crossing.

Herbert Bachenberg
Box 804 R#5
Los Angeles, Cal.

DEVICE RECOVERS ARTICLES

8214 *H* LOST WHEN BOAT UPSETS

One of the unpleasantnesses sometimes experienced by sportsmen, that of losing a valuable gun or favorite



A Gun Dropped in a River may be Saved If It is Fitted with This Restorer

fishing rod in the water, is eliminated through the application of a simple mechanical device which has recently been patented. With it an article which drops to the bottom of a lake when a canoe unexpectedly capsizes may be restored in a few minutes' time. The instrument is made of brass, is cylindrical in shape, weighs 2 oz., and may be screwed to the end of a fishing rod or clamped to a gun so that it is not cumbersome. Its mechanism consists of a strong spring, a cork spool carrying from 40 to 75 ft. of silk line, and a perforated cap which is held in place by a fiber cord. Within a few seconds after it is submerged in the water, the fiber

string gives way under the pressure exerted by the spring. This pushes off the cap and liberates the cork spool, which unwinds the line wrapped about it as it rises to the surface. When the cork appears at the top it holds a strong line, the opposite end of which is attached to the sunken implement or package, that may then be pulled from the bottom without difficulty.

AUTOMOBILE TOP SERVES AS

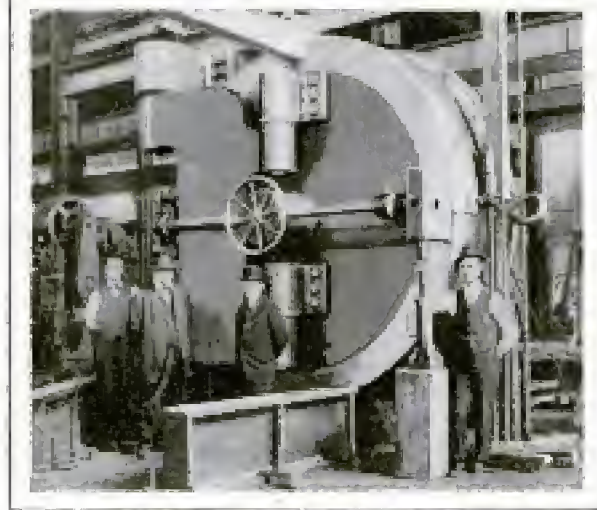
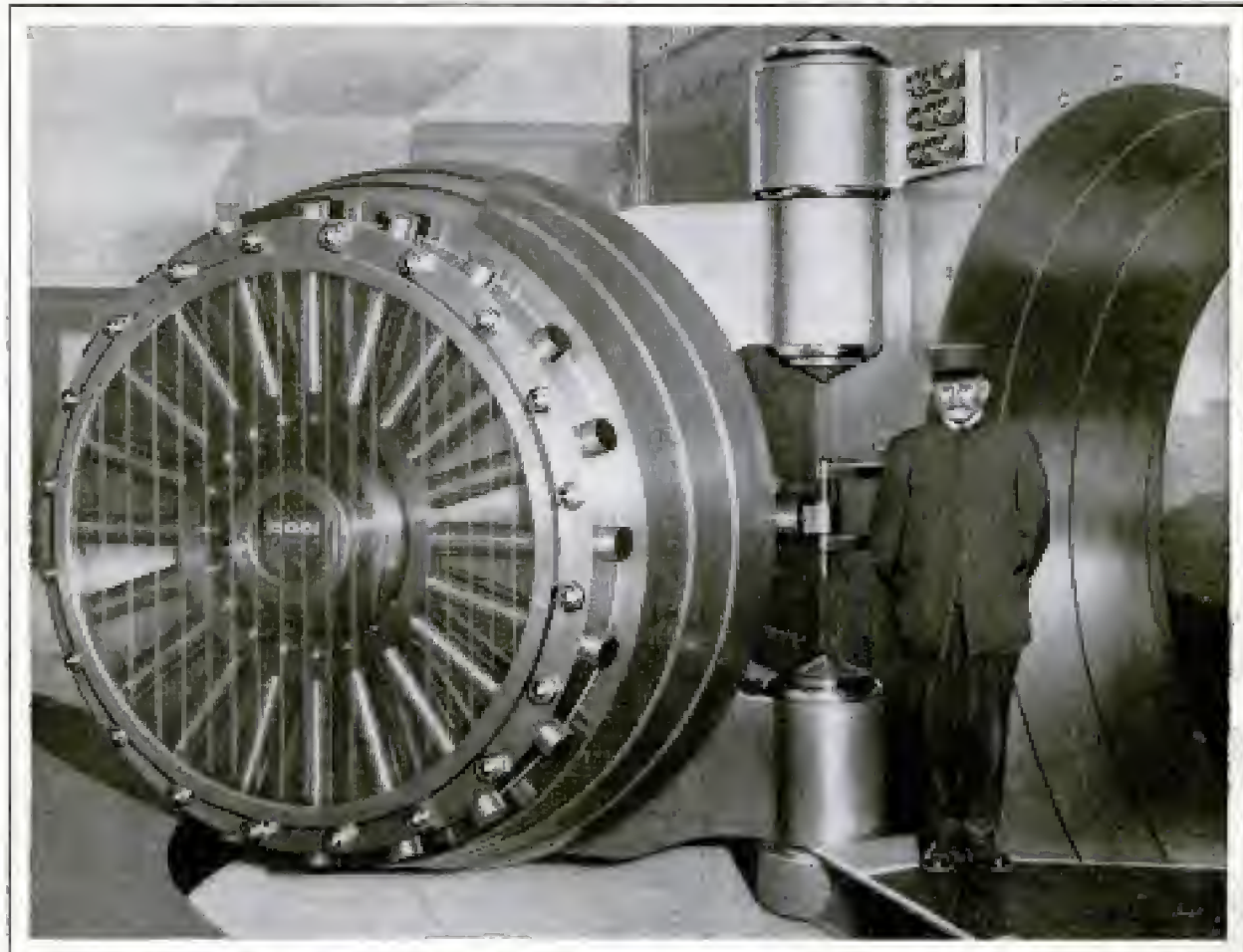
8576 *M* WIRELESS ANTENNAE

One of the latest developments in wireless telegraphy in warfare, which consists in converting the stripped wires of an automobile top into antennae for a telephone apparatus carried on the car, was brought to light recently when a British patrol captured a German touring car in Belgium. The engine had broken down, and the two German officers in the car were made prisoners. The raised top consisted only of the wire skeleton, and in glancing over the car one of the patrol noticed that a wire led from this to a point under one of the seats. At the end of this wire was a telephone receiver, and when this was placed to the ear messages could be distinctly heard coming from the headquarters of the army corps to which the German officers belonged.

ENORMOUS DOORS FOR BANK

8527 *M* VAULTS

Two of the largest bank-vault doors ever built have recently been made for banking institutions in New York City and Toronto. The door for the New York institution cost \$75,000, while the total cost of the door and vault will be about \$200,000. Door and vestibule together weigh 120 tons. This door is made of armor plate, the same as used in the construction of modern battleships, and will withstand drilling, sledging, wedging, and even a cannon shot. It is 9 ft. in diameter and 45½ in. thick, and is locked by twenty 5-in. plungers. So great is the precaution against both robbery and the danger of



Vault Door Made for New York City
Banking Institution

Door and Entrance to Safety-Deposit Vault of Bank
in Toronto, Canada

ducing a liquid explosive for blowing open the door. The vault is three stories high, and is so solidly built that if the building should collapse, the vault would remain intact.

The vault in Toronto is one of the most strongly built vaults in the world. It consists of a hollow cube made of hardened steel and cement, and measures 30 ft. in each direction. This vault has two stories, the upper story being for the use of the public as a safety-deposit vault, and the lower story for the storage of the bank's currency and securities. A floor of solid steel separates the two stories. The vault is guarded by circular steel doors, 10 ft. in diameter, 4 ft. thick, and weighing 41 tons, which are opened and closed by electric motors. When all the precautionary devices are set, three different alarms are sounded by the slightest tampering with the doors, one of these alarms being located outside of the building.

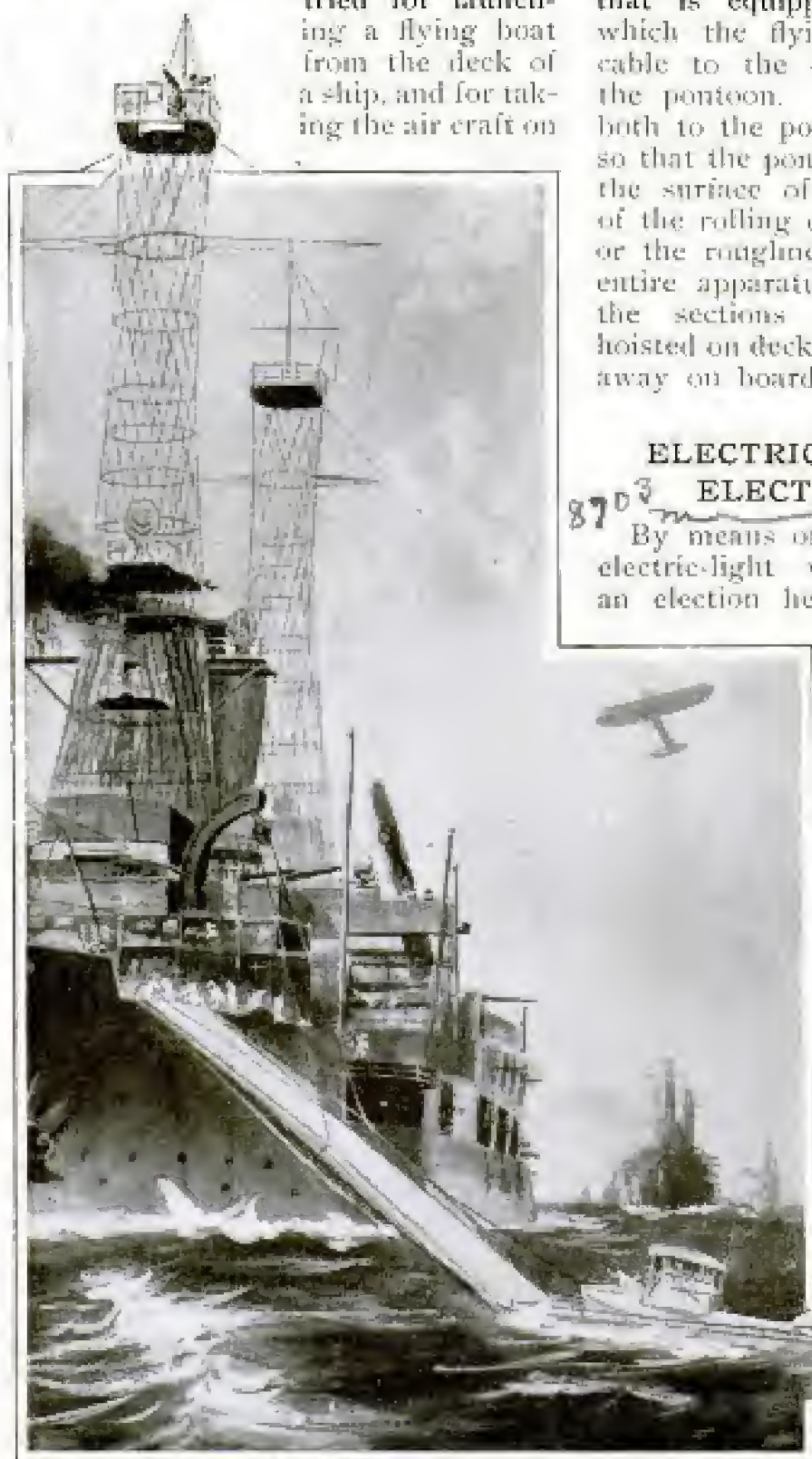
lockout that the plungers are controlled by combination locks, which in turn are controlled by a time lock having four movements, any one of which will permit the opening of the combination locks. This massive door swings on a crane hinge and is operated by a mechanical pressure apparatus. When closed, it is air-tight and water-tight, so that there is no possibility of intro-

LAUNCHING A FLYING BOAT FROM A SHIP'S DECK

8606

Various methods, none of which has proved satisfactory in case the ship is rolling or pitching, have been tried for launching a flying boat from the deck of a ship, and for taking the air craft on

board after a flight has been finished. A recent English invention apparently solves the problem. The apparatus consists simply of a floating pontoon with a submerged launching way and connected with the ship by a bridge that is equipped with rollers over which the flying boat is drawn by cable to the deck, or let down to the pontoon. The bridge is hinged both to the pontoon and to the ship, so that the pontoon moves freely with the surface of the water, regardless of the rolling or pitching of the ship, or the roughness of the water. The entire apparatus is so designed that the sections can be disconnected, hoisted on deck by derricks and stowed away on board the ship.



This Floating Pontoon, Connected with the Ship by a Hinged Bridge, is a New Invention for Launching or Taking on Board Flying Boats

ELECTRIC LIGHTS WINK

8703

ELECTION RESULTS

By means of signals sent over the electric-light wires, the results of an election held in St. Louis were flashed into 50,000 homes and practically all the theaters in the city within five minutes after the vote had been counted. These signals consisted of a code of "winks," or flashes, the meaning of which had been made known in advance, and which were produced by opening and closing the switches in the substations. In this way several hundred thousand persons were informed in less than five minutes that a \$2,750,000 bond issue had been passed, to finish the municipal free bridge that had been costing the city about \$490 a day in interest.

Wm. J. Ries, 3501
Washington Blvd.,
St. Louis, Mo.

*Saul Verkin, 1922 Avenue M & 1/2 Galveston,
8840 m Texas*

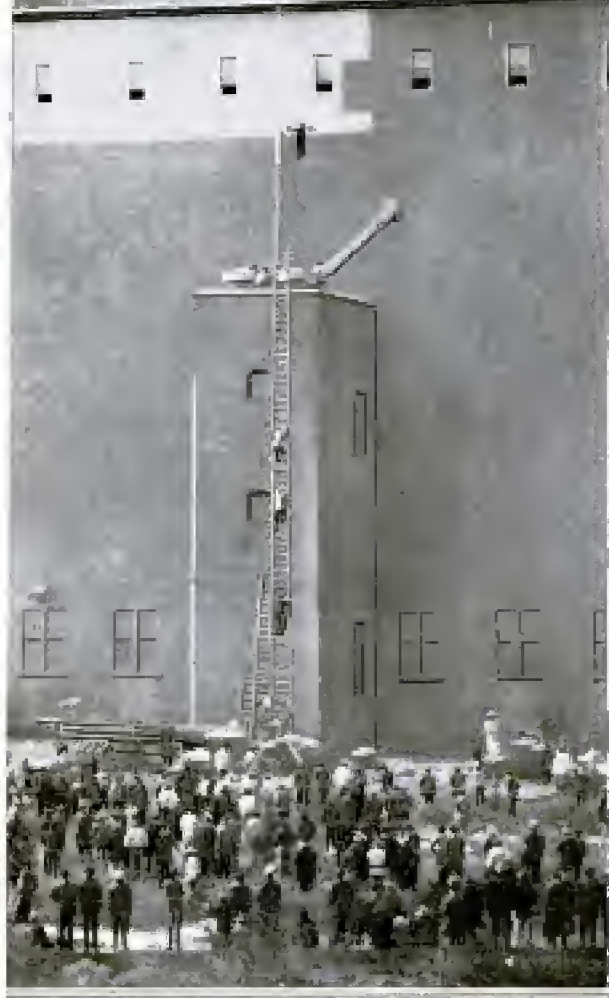
FIREMEN MAKE THRILLING LEAP FOR LIFE



How the Elevator
Looked Four Hours
after the Fire Started



All That Remained of the Elevator after the Fire
Was a Smoldering Heap of Ruins and the Brick Shaft
through Which the Firemen were Rescued. A Snap-
shot of a Fireman Leaping from the Roof into a Life Net
Held on the Top of This Tower is Shown at the Left



Six firemen, caught on the roof of a burning grain elevator at Galveston, Tex., 150 ft. above the ground, jumped, one at a time, into a life net held 60 ft. below, and with one exception, escaped without serious injury. The net was held on the top of a brick shaft reaching 90 ft. up the side of the building, which could only be gained by means of extension ladders. In one case the net broke from the hands of the rescuers, and the fireman was seriously injured. The six firemen had mounted to the top of the building in the freight elevator. Within a few minutes the flames had run up the elevator shaft, and with all retreat cut off, the firemen were driven out on the lower roof of the building. This roof was beginning to fall in as the last fireman jumped. The elevator was completely destroyed, with a resulting loss of about \$2,000,000.

IRON CROSS CONVERTED INTO MARBLE SYMBOL

8636 m

An iron cross in a cemetery at Kansas City, Mo., known locally for



"The Black Cross" with the Form in Place for Molding the Marble Concrete



How the Cross Looks after Its Transformation into a Marble Monument

many years as "The Black Cross," has been converted into a marble cross by the simple expedient of covering it with concrete made from crushed marble. Even in this age of concrete building a monument of this kind made with a "form" instead of a chisel is unusual

enough to merit attention. The form used in molding the concrete was set up around the iron cross, which now serves simply as reinforcement. After the form was removed the surface of the concrete was buffed and polished so that even on close inspection it has the appearance of chiseled marble. It measures 15 ft. high and 12 in. thick, and is 6 ft. wide at the cross and 2 ft. wide along the shaft. The figure carried by the cross is sculptured from a solid piece of white marble and is held in place by iron spikes.

MOTORCYCLE DRIVEN ALONG PERPENDICULAR WALL

883

Going at a speed of from 75 to 85 miles an hour, a motorcyclist succeeded in driving his machine around the perpendicular wall at the top of a motordrome. This is a regular amusement-park feat for automobiles, but is seldom attempted with a motorcycle, since the machine must be driven at terrific speed and must stand out almost horizontally from the wall. It is a good example of the power of centrifugal force, as well as of the skill and nerve of the driver.



This Remarkable Feat could Only be Performed with the Motorcycle Going at a Speed of from 75 to 85 Miles an Hour

J. H. Blaine, General
Delivery, San Diego, Cal.

Francis J. Dickie
17-18 Hanover Bldg.,
Bellamy St.,
Edmonton, Canada



Land Office and the Rude Shelters the Homesteaders Occupied during Their Long Wait for a Chance to File on Canadian Land

The Men at the Right of the Door Waited Eight Months in Order to Hold Their Turn

CANADIANS WAIT LONG TO FILE ON LAND

8458 m

What is believed to be the longest wait in history for a chance to file on public land has just been completed at Grouard, Alberta, Canada, where a few valuable tracts of government land were assigned to homesteaders. The land was given out in the order of priority at the land-office door, and some of the men camped in front of the land office for eight months in order to hold their turn, sleeping in rude shelters through the greater part of the Canadian winter, and taking their regular positions at the door each day. This method of allotting land is somewhat like that employed in the United States before the system of drawing by lot to determine priority was established, when all applicants were lined up half a mile from the land office and started by a pistol shot on a race for the door. The Canadian land regulations recognize only the right to priority as determined by a man's position in the line at the time of the allotment, but the principle that the first on the ground shall have first place in the line is so well recognized by the men throughout western Canada that a newcomer trying to break in ahead of his turn would be sure to receive drastic treatment.

DOG PICTURE FORMED BY GRAIN OF WOOD

8704 m

When a workman had finished cutting a strip of veneer from a log of black ash, he was surprised to find a "dog" in it, the dog in this case consisting of an arrangement of grain and color that formed a very good representation of the head of a bull pup. This was photographed just as the saw



This Interesting Picture of the Head of a Bull Pup Is Due to the Natural Arrangement of the Grain in a Strip of Black-Ash Veneer

had left it, and the result was the animated and intelligent-looking portrait shown in the illustration.

A method for detecting minerals in flour and drugs by means of X-rays has been developed by an Italian inventor.

C. E. Eckstein, 1903 Men & Women
the Angles, Cal.

HOW THE FRENCH COLONISTS DEFENDED PAPEETE

Shortly after the opening of the European war, Papeete, the principal town of Tahiti, one of the French islands of the Society group, in the South Pacific, was bombarded by two German cruisers and partly destroyed. The photographs of the results of the bombardment, published herewith, were accompanied by a detailed account of the assault, written by a French photographer who took part in the defense of the port. Because of the interesting and direct way in which his story is told, it is printed here without change.

"Bombardment of Papeete, Sept. 22nd, '14.

"6 P. M. Regular soldiers and soldiers of the reserve went to the casement as usual, and were sent home very early on account of the rain.

"7 A. M. Everything was very quiet, we were glad to be free once more. All at once the signal gun fired. We rush to the casement and heard that two cruisers were in sight having no pavillon [flag]. The atmosphere was dull. Our battery fired two shots in order to ask the pavillon. The answer was a shell and the German vessels raised up their pavillon. We were joking on the ranks, thinking it was English or Japanese vessel. When we heard the shells above our head we got anxious. It was the two largest German cruisers of the Chinese division, Scharnhorst and Gneisenau, 11,600 tons each.

"They opened fire and asked the town to surrender. The Commandant Destremeau answered by signal No we shall not and ordered to set fire to the coal. After a few minutes a thick smoke indicated the German the coal was burning and there was no chance for them to renew their provision. They got mad and set fire on the town who quickly set in fire. They tried to shot the battery without success. The French sailors started to open the watergates of the French gun boat Zelée who was disarmed in the harbor closed to the wharf. The German

help the work in sending some shells to the boat. We did the same thing to the captured German cargo boat Walkure and they gave us the same help.

"It is a miracle if we have not been all killed as we were sheltered only by some wood houses. Fortunately the German could not see the town all covered with trees. Greater damage might have been done. Women, children and natives fled away. After three hours gunning we saw the two cruisers going away thinking very likely the whole town was in fire. When we saw they were not shooting any more we started against the fire and after some hours heavy work we mastered it. Owing to the rain and the absence of wind the town could be preserved. If the German had gone on shooting and the wind blowing everything would have been destroyed. We have been very lucky to save our place from being German and to lose only two lives, one Chinaman and one native. About 100 to 127 shells were shot. Some say more."

STOPPING DISTANCES FOR AUTOMOBILES

8412 Experiments made in New York for determining the shortest distances in which an automobile can be stopped when running at different speeds show that every increase of 50 per cent over 20 miles an hour increases the distance required for stopping over 100 per cent, and that a car running 40 miles an hour will go more than four times as far, before it can be stopped, as a car running at half that speed, or 20 miles an hour. The tests were made with a 50-hp. car with brakes in perfect working order. At eight miles an hour, the car was stopped within 6 ft., while at 15 miles an hour, 15 ft. of distance was required. A space of 25 ft. was required for stopping with the car going at 20 miles an hour; 53 ft., at 30 miles an hour; 87 ft., at 35 miles an hour, and 103 ft., at 40 miles an hour.

Amesbury
The Motorist, Sept. 24

437-5 H. at

Ref. to Assoc. N. Y.



Above: Section of Papeete's Principal Business Street Still Smoldering from the Fire Caused by German Shells

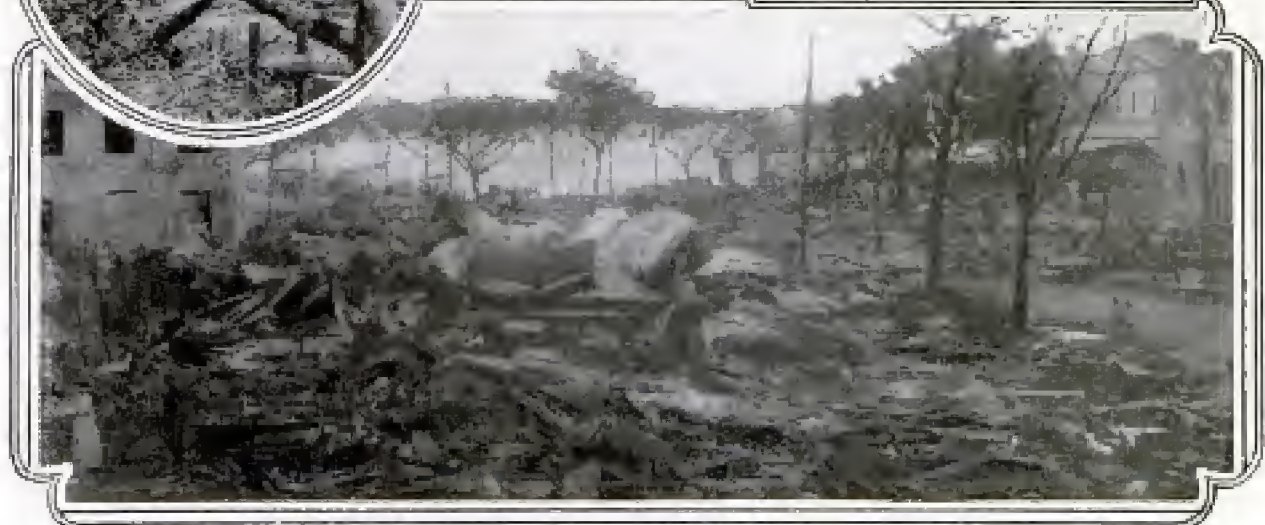
Below: The German Steamer "Walküre," a French Prize of War, Sunk by German Shells in Papeete Bay during the Assault

The "Walküre" Captured by French Gunboat



Town Market Place Cut to Pieces by the German Shells

Below: The Chinese Quarter of the Town Suffered Severely from the Attack. Its Buildings Were in the Line of Fire and Hardly a Wall was Left Standing When the German Cruisers Put to Sea



J. W. Lee, Jr., Machinery Agent,
Penn. R.R. Co., Broad St.,
Station, Phila., Pa.

BRIDGE ROLLED INTO PLACE

8696 ft
IN ELEVEN MINUTES

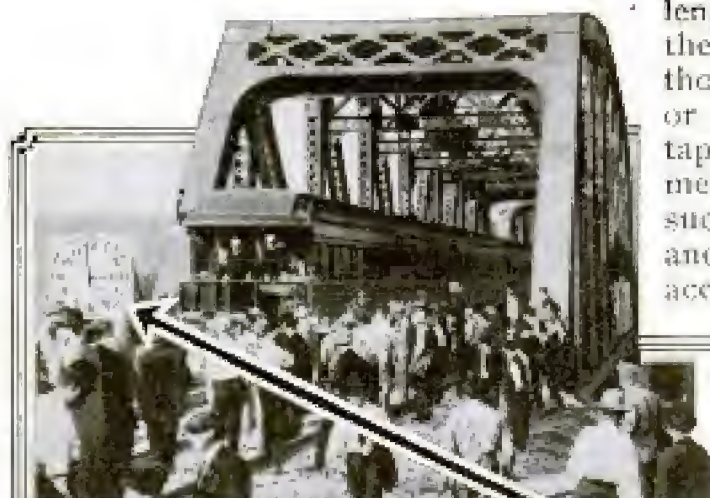
Rolling into place a three-span steel bridge, having a total length of 720 ft. and weighing 7,000,000 lb., and finishing the job within 11 minutes without interfering with traffic, was the feat accomplished recently at Tyndall, Ohio, when a permanent bridge was installed for the Pennsylvania Railroad over the Muskingum River to take the place of the one washed out in the big flood of 1913. The new bridge consists of three truss spans, each 240 ft. long, which were built across the river on a line 45 ft. downstream from the permanent line of the railroad. The interesting feature of the work was the method used for moving this structure to its final position. As soon as the new spans had been put together, traffic was diverted to the bridge in its temporary position, and the old repaired structure was removed. When all was ready, the three spans were shifted as one structure with ties and

rails in place, being rolled into place on 2½-in. steel rollers resting on rows of 85-lb. rails. Power was supplied by two derrick cars equipped with hoisting engines, which were placed end to end on the middle span and anchored. From each of the four drums of the hoisting engines steel-wire cables were led through a series of sheaves attached to various points on the spans and anchored to "deadmen" at the upstream ends of the piers and abutments. An ingenious indicator, made of piano wire, pulleys, weights, and a scale graduated to feet and inches, in plain sight of the person directing the operations, served as a guard against one span being moved faster than the others. The actual moving required less than seven minutes, while the tracks were disconnected for a period of only 10 minutes 17 seconds.

HUNDRED-FOOT STANDARD

883' CAREFULLY GAUGED

Under the supervision of the United States Bureau of Standards, a 100-ft. length standard has been installed in the city hall at Chicago for the use of those who have occasion to compare or rectify the graduations on steel tapes, or other long instruments of measurement. It is one of the very few such rods in existence in this country, and is claimed to be the most nearly accurate of any.



The New Bridge, 11 Minutes Later,
with Train Running over It



The New Bridge Complete and Ready for Moving

Western Society of Engineers - Chicago



This 100-Foot Length Standard Agrees More Nearly with the Standards at Washington Than Any Other in This Country

The rod, which is made of steel, is 102 ft. long, 2 in. wide, and $\frac{1}{2}$ in. thick. To facilitate its installation, it was originally made in six sections, which, when placed in the room especially designed for the standard, were welded together by the oxyhydrogen process. It rests on rollers which are fixed to wall brackets allowing perpendicular adjustment, so that the top surface of the rod is secured in a level plane. Cylindrical disks of a platinum-iridium alloy were inserted flush with the surface of the rod, to carry the graduation marks, at zero, 1 ft., 1 yd., 1 meter, 10 ft., 25 ft., 50 ft., 66 ft., 20 meters, and 100 ft. At the zero end a clamp is provided to grip one end of the line to be tested, while at the opposite end is a spring balance that exerts a pull of a desired number of pounds upon the tape.

The extreme accuracy of the rod is indicated by the Bureau of Standards certificate, which shows that the error of the 100-ft. interval at 83° F., reduced to 62° F., amounts only to +.002 in., while the intervals of 25 ft., 50 ft., and 30 meters are absolutely exact with the standards at Washington. The rod was presented to the city by an engineering society. A record of every comparison made is kept by the map department of the city.

¶ To prevent its exportation, the Russian government has placed an embargo on lumber.

MAN'S WEIGHT IN BULLETS

8818 TO KILL ONE MAN

Chicago Record Herald
In spite of the efficiency of modern weapons it is estimated that the average weight of bullets required to kill one man in the present war is something like 168 lb. This is a little more than the weight of the average man himself.

NEW PORTABLE ELECTRIC TOASTER STOVE

A portable electric stove designed for toasting, frying, and grilling, and small enough to be used on a dining table, is arranged so that two pieces of bread can be toasted at one time, one being placed on the top grating and the other in the grill pan below the heating element. For frying, the pan is drawn out and placed on the grating, the body being so designed



Portable Electric Stove of New Design

that the pan covers the entire top surface. The stove is equipped with a grid which fits into the pan and is used for grilling.

*The Rutan Electric Co.
Logansport, Ind.*

The American Boy - October 1914
MINE CANARIES REVIVED
 8422 **WITH OXYGEN**

Owing to the fact that canary birds are extremely sensitive to the effects of carbon monoxide, the deadly "white



In a Test for Determining the Effect of Carbon Monoxide, It was Shown That a Miner could Survive at Least Eight Minutes after a Canary had Died from Asphyxiation. Insert Shows Canary-Bird Cage with Oxygen Tank for Reviving the Bird

damp" of coal mines, they are now regularly used for detecting this gas in the workings of coal mines. This proceeding is rather hard on the birds, as they are immediately affected by gas in such small quantities that it cannot be detected in any other practical way, and they often fail to recover when gas in dangerous quantities is found. The extreme sensitiveness of the canaries to the effects of the gas was demon-

strated recently when a canary bird and an inspector of the U. S. Bureau of Mines were shut up together in a glass cabinet, into which a small quantity of carbon monoxide was piped. Without feeling any serious effects, the inspector was able to remain in the cabinet for eight minutes after the bird had died from asphyxiation. To save the lives of as many birds as possible in actual mine work a cage with an oxygen tank attached is now being introduced. This cage is made tight and has glass sides and a glass door, the door opening being screened. The door is left open while tests are being made, but as soon as the tests are completed the door is closed and the birds are revived with the oxygen.

The Sketch - Oct 21, 1914
LONDON TAKES PRECAUTIONS
 876 **AGAINST ZEPPELIN BOMBS**

Among the precautions taken by Londoners in anticipation of a raid by German airships is the anti-Zeppelin insurance issued by Lloyd's. Policies insuring against damage done by bombs dropped from these airships are issued at the rate of about \$6.25 for each \$5,000, on residence property, and at from \$8.25 to \$12.50 for the same amount, on business property. As a measure of protection against the bombs, some of the houses are being equipped with strong steel netting firmly supported above the roofs, with the idea that the netting will be sufficient to explode the bomb and save the building from damage.

NATIONAL WIRELESS-RELAY
 8494 **LEAGUE IN OPERATION**

The organization of a national league of amateur wireless-telegraph stations for relaying messages, which was noted in a recent number of this magazine, has been completed, and it is now possible to transmit messages to practically any part of the country. There are now about 400 stations in the league, forming an almost continuous chain from coast to coast.

Hiram Percy Maxim
The Maxim Silencer Co.
Hartford, Conn.

*J. Henry Fuschen, 108 Fulton St.,
N.Y. City*

8508
H

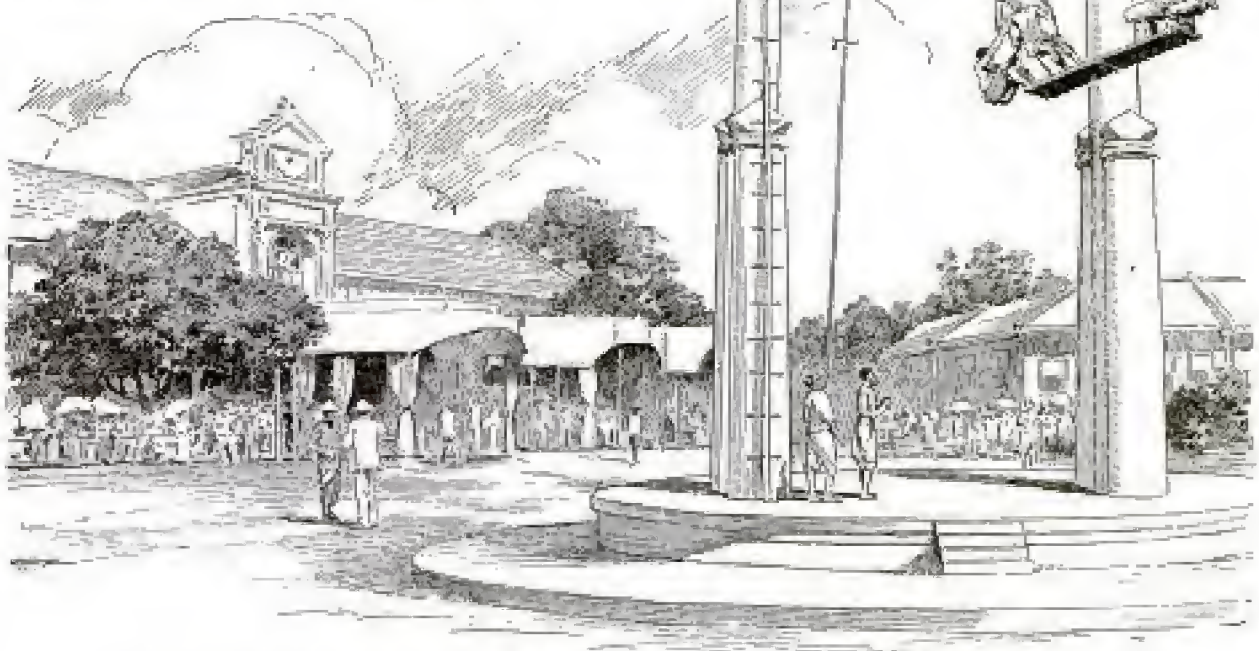
POPULAR MECHANICS

187

ANNUAL SWINGING FESTIVAL AT SIAMESE CAPITAL



At about the same time each year that the Christian peoples of the world are celebrating the Christmas holidays, the swinging festival, a pompous harvest ceremony, is observed at Bangkok by the Siamese Brahmanists. This custom is religious in its character and held for the purpose of thanksgiving for the crops that have been reaped, and to invoke divine favor for the



Annually at the Capital of Siam a Swinging Festival is Held to Invoke Divine Favor
and Insure Prosperity for the Coming Year

coming year that there may be a sufficiency of rain to insure general prosperity. The central figure on this occasion is a nobleman, appointed by the king, who appears as the "sovereign of the lower heaven." At the proper time, ostensibly coming down from above, he makes his way in state to the public square at the capital, where the rites are performed, is received ceremoniously and led to a temporary throne, before which, in the middle of the common, is a large swing, the framework of which extends to a height of about 50 ft. A short distance west of this is a tall pole at the top of which is fastened a bag of coins.

When the "sovereign" arrives on the day of the festival and is stationed at the place prepared for him, he seats himself and crosses his legs. This is a signal for the invasion of the square by the populace. With much scrambling and laughter the people pack the

area, while at the same time four men who proclaim themselves to be in the grace of the "rain giver" take their places on the swing. The priests take their places, and prayers are offered while the men, pulling at the ropes, start the great swing moving slowly to and fro. As they are carried out far to one side and then to the other, one of the men leans out, watching his opportunity, and attempts to grab the bag of coin with his teeth. If he performs the feat at the first trial, shouts of extreme satisfaction greet him from below, but if he fails, there are equally loud cries of discontent. The performance is repeated three times while the mock king looks on intently, not changing his posture, and when it is completed he departs, so satisfied with the manner in which the swinging has been conducted, if it has been well executed, that he promises prosperity for the coming year.

NOVELTY IN RAILROADING IS ALL-STEEL CABOOSE

8492 In order to provide greater safety for freight-train crews as well as to prevent property loss in wrecks and

caboose ever constructed. The designing of this car offered several interesting problems, as it had to be built



All-Steel Caboose to Provide Greater Safety and Comfort for Train Crews

comply with various state laws regulating the comfort of railway employes, the Pennsylvania Railroad has built and placed in service the first all-steel

as strongly as the heaviest freight cars, while providing accommodations approximating passenger grade. The caboose is 31 ft. long, and above the floor has been constructed without posts, the necessary rigidity being achieved by means of sheet-steel bulkheads. The equipment includes three pairs of bunks, the lower ones serving as seats, for which the upper bunks, when lowered, serve as backs.

A stove for heating and cooking, water cooler, washstand, refrigerator, desk, and lockers and drawers for the crew's personal belongings, are also provided.

*J. W. Lee, Jr., Publicity Agent Penn. R. R. Co.
Broad Street Station, Phila., Pa.*

COMMENT AND REVIEW

JUST as the previous issue of this magazine came into the hands of its readers, the long-hoped-for decision of the Interstate Commerce Commission was declared. It allows the 5-per-cent increase so long deferred. Of course, the railroads included in the decision should be duly grateful, but it seems a pity the ruling body could not have reached the same mind months ago.

The Rate Increase

When the question was pending in the spring of 1914, a prominent railroad official in one of the larger railroad centers stated that in that one city alone the roads running out of it would hire and send out on the various lines for track repairs an aggregate of 40,000 men if the favorable decision were reached then. For weeks these men by the thousands besieged the railroad employment bureaus, waiting in vain for the ship which did not come in. While some weeks must necessarily elapse before the roads can cash in on the new rate, the management will feel warranted in planning for long-needed repairs that will be undertaken the coming summer and which will furnish employment for many thousands. If the increase is right and proper now, it was equally so a year ago, and would have been a godsend to those who were out of employment in consequence.



SQUIRRELS, ants, and bees lay by, in season, food supplies against the winter; man as he became civilized did the same. It's a far cry from the potatoes and apples which the New England colonist put away in his cellar each fall to the mammoth cold-storage plants of our great cities, but each is based on the idea of equalizing the supply of food and carrying over into those months when such things are not produced the foods which otherwise are abundant for short seasons only.

Equalizing Periods of Work

As long as the great majority of the people raised sufficient foods in part of the year to carry them through an entire year, they could afford to do little or nothing during the winter months. Under our present division of labor, the people who raise foods are less than half the population. The others work in mills and stores and at a thousand things which are worth doing, but are not food producers but food buyers. Hence, it is more difficult for many of them to lay by either food or the price of food against the winter when the work they are accustomed to do is scarce or lacking entirely.

If, then, some philanthropist of employment can study out a practical plan by which part, even, of the less skilled, manual work could be equalized, it would be a great boon to thousands. In other words, instead of using up all that class of work during the summer months, put enough of it in a sort of cold storage to be given out during the winter months of restricted employment. No small part of public improvements might be used as winter work, for instance. The objection, of course, is that owing to the weather a man cannot do as much as in summer, which means the same work must cost

more in winter. The only way to equalize this would be to pay less per hour. The labor unions would doubtless object, preferring the men go without work than to accept less than what goes as standard summer wage. It would seem reasonable, however, to make this adjustment, the lower scale to be in force during winter months only, and thus provide work where otherwise there would be none.

We plan years ahead in laying out streets and parks and all sorts of things, but apparently no one has made a consistent effort to plan a few months ahead to provide employment for those thousands who are willing to work, but find themselves without work every winter.



NOT in years, and certainly at no time in the past half century, has there been as earnest, wide-spread consideration of the question of national defense as now. Mark the word, defense. Of all the great

*Question
of
Defense*

nations of the world, ours alone may fairly lay claim to an honest and sincere policy of not wanting colonies. On the other hand, those recent acquisitions which fell to us as an accident of war cannot honorably be left to face the world alone in their present strength. The question of national defense, however, does not now hang so much on our responsibilities across seas as

on what our own vast seacoast requires. In addition, there is the Monroe Doctrine, which is liable to be put to the test at any moment.

Our unprotected boundary to the North is offered by some as a glowing emblem of a century's peace with unpreparedness. Our friendly relations with Canada, however, are, unfortunately, an isolated instance, and exist under conditions not found anywhere else. In addition to that close relationship of color, speech, habits of life, education, opportunity, and blood relationship, it must be remembered Canada also is not striving after colonies in distant climes.

Nothing could be farther from the wish or consent of our people than to call down the monolith of militarism which has so long hung about the neck of European countries. Yet there is fitness and appropriateness in all things. No one questions the frequent increase in men and machines for the fire department of a growing town, and, until our cities are rebuilt and made entirely and absolutely fireproof, there will and must continue a necessity for protection, and the more city the more protection required. And will any one say our nation, of which its cities are only parts, should be any less prudent in safeguarding against the infinitely greater conflagration of war?

Our railroads in the snow zone have invested, I don't know how many million dollars, in giant snowplows. The railroad manager is never tempted to parade his snowplows just because he has them; they are seldom ever seen by the public, yet until the day when the clouds cease to shake down their snow mantles, the snowplow cannot be neglected. A transcontinental road would not expect to operate through trains with a single plow for each 500 miles. Neither does the railroad manager deplore the winter when his plows remain idle; on the contrary, an idle snowplow pays its largest dividends.

Our army and navy should be commensurate with our national size and responsibilities; not an unwieldy, overbearing octopus, but

suitable and fit. The spirit and temperament of our people effectually take us out of any suspicion of ever reaching for what belongs to others. To be in a position to defend what is already ours can command only respect.



IN addition to more men for exclusive work in army and navy, our second great need is a trained soldiery without taking large armies of men from their ordinary occupations. This is something which has not yet been worked out. President James, of the University of Illinois, suggests a plan which seems good. Most of the state universities already have a few drills each month, under the direction of a commissioned army officer. Doctor James would go farther and recommends the payment of wages to each student who will devote sufficient time each week,

*Plan for
Army
Reserves*

throughout the collegiate year and the entire course, to make himself proficient in the study of arms. Such students could easily graduate with the rank of at least second lieutenant, and while engaged in whatever business or occupation they chose, would always be available for immediate use in time of need. He estimates such a graduation of 2,000 young men annually after the first four years, from his state alone. It will be seen what the yearly outturn would amount to in the entire country. The plan, with doubtless some modifications and additions, would seem to be both practical and economical, and avoids the objection to a compulsory military service which would take the entire two or three years out of a young man's life at a time when he should be fitting himself for his life's work.



IT is a matter of profound regret to the millions of both countries that the anniversary of 100 years of undisturbed peace between Canada and the United States seems unlikely to be celebrated at the time set. Under the circumstances a postponement was the only course. We can, however, as individuals, each of us recall with mutual satisfaction the long years of friendliness which each succeeding year has served to strengthen. Three generations have enjoyed immunity from strife; and were it not for the good-natured offices of a few customhouse officials, it would

*The
Century
of Peace*

be difficult for one to know when he had left one country and entered the other. There is no desire or attempt on the part of either country to take unfair advantage of the other. Travel and communication between us is unrestricted. Neither is jealous, and each sincerely wishes for the other the largest degree possible of wealth and happiness. With a confidence born of a hundred years of mutual trust and regard, Canada and the United States step out arm in arm with the new century. That those coming years may bring to our good neighbor on the north the fulfillment of all those grand possibilities her great natural resources offer, and her brave and determined people so richly deserve, is the sincere hope of every true American.

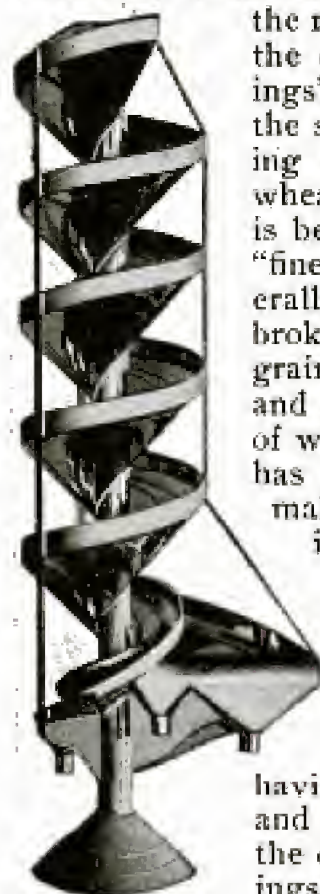
H. H. WINDSOR

Dec. 22, 1914.

SEPARATING THE MUSTARD FROM SCREENINGS

8539 m

A device of the greatest interest to millers is a machine for separating the mustard seeds from the other "fine screenings" that come from the sieves of the cleaning machine when wheat, barley, or oats is being handled. The "fine screenings" generally consist of grass, broken and shriveled grains, and other seeds, and a large percentage of wild mustard, which has a market value making it worth saving. The separator



has no moving parts and consists of three inclined spiral chutes of different diameters having smooth surfaces and placed one above the other. The screenings are fed into a hopper at the top of the separator and drop on the central chute surrounding the column. The mustard seeds, being round, attain a velocity which causes them to roll from the central chute to the middle one, and a little farther down they jump from the middle to the outer chute. The other seeds, being irregular in shape, slide down the middle chute, while the remaining screenings cling to the central chute. Each chute is equipped with a hopped outlet at the bottom.

BOTTLING MILK WHILE IT IS HOT

8631 m

Laboratory experiments conducted by investigators in the Department of Agriculture indicate that milk may be pasteurized, bottled hot, capped with ordinary paper caps, and then cooled with a blast of air, with results that are satisfactory both economically and

as a reliable means of reducing bacteria. One of the advantages in the method is that there is less danger of infecting the milk, in case of a slightly defective cap or chipped bottle neck, than there is when the bottled milk is heated by steam and then cooled with cold water, as in the present commercial process. If the experience in the laboratory is found to hold true in commercial practice, which remains to be seen, it is possible that this method will supersede the present method of pasteurization.

ROSE VINES PROTECT BIRD HOUSES FROM CATS

7736 m

Bird lovers often find it a most difficult problem to devise means to prevent neighborhood cats from frightening away their feathered pets and robbing the nests of their young. A New York man who makes his garden an aviary, and who at the same time is not a hater of cats, planted climbing-rose vines about the base of the poles supporting his bird houses. While these added greatly to the appearance of the garden, they also served very



Bird Houses
Safeguarded
by Climbing
Rose Bushes

efficiently in keeping cats from crawling up the posts. The birds, understanding their security, were no longer frightened from their nests.

A tunnel has just been completed under the Rhine for connecting coal-mining properties located on opposite sides of that river.

Information sheet from
Dept. of Agriculture

FATAL AEROPLANE ACCIDENTS IN 1914

Exclusive of Deaths in War, One Hundred and
Forty-Nine Airmen were Killed

HOW many lives were lost in 1914 in aeroplane accidents will not be definitely known until official reports of the aviation fatalities of the great war are made public. The meager reports that have come from European battle fields have told of the heroic deaths of many flying warriors. The full list of airmen sacrificed in the conflict of the nations may not be available for months, or even years. It is therefore impossible at this time to make an exact comparison of the aviation deaths of 1914 with those of 1913.

Excluding fatalities directly due to the war, or occurring since the war began and not reported because of war conditions, the total aviation-death list for 1914 contains 149 names. Added to the 192 of 1913, 140 in 1912, 77 in 1911, 32 in 1910, 4 in 1909, and 1 in 1908, this makes a total of 595 persons who have lost their lives through aeroplane accidents since the Wrights made the first mechanical flights. In the first seven months of 1914, for which complete figures are available, 130 deaths occurred, as against 114 in the same period of 1913.

Only 15 American airmen were killed in all of 1914. Eighteen Englishmen, 24 Frenchmen, 37 Germans, 18 Russians, 7 Italians, 3 Belgians, and 15 persons of other nationalities were killed in the first seven months of the year, while peaceful accidents in the remaining five months, so far as reported, caused the deaths of 7 Englishmen, 4 Frenchmen, and 1 Argentinean. One hundred and sixteen of the victims of the year's accidents were aeroplane pilots and 33 were passengers and mechanics. In 1913 there were nine deaths of spectators who were struck by falling aeroplanes or hit by propellers, but not a single accident of this kind occurred in 1914. One death not tabulated here was that of a spectator who was uninjured, but died of shock after seeing M. Borrer fall to his death in Switzerland.

Ten of the year's fatal accidents

were reported as due to the carelessness or mismanagement of the pilot. Eight were caused by engine trouble, 7 by collisions in the air, 25 by capsizing or side-slipping, and 20 by faulty machines. Nine deaths were due to accidents in landing, while the causes of the others are unknown or unreported. Nine of the victims of the year's accidents fell into the sea, or other water, and were drowned, while six were burned to death. Thirty-six of the machines in which these accidents occurred were biplanes, 26 monoplanes, and 9 flying boats, the types of the others not being reported.

Perhaps the best-known airman whose death was recorded in 1914 was Gustav Hamel, an Englishman whose skill as an air pilot was recognized everywhere. Hamel, on May 23, after making a successful nonstop flight from London to Paris in a monoplane, started to return to England. He was last seen alive on the coast of Brittany, apparently about to start on a flight across the channel. Weeks later fragments of a monoplane, believed to be his, were picked up at sea. Another distinguished airman killed in 1914 was Jorge Newberry, president of the Argentine Aero Club, who lost his life in an attempt to fly over the Andes Mountains on March 1. Three American officers, Lieut. J. D. Murray of the Navy, and Lieuts. Henry B. Post and F. J. Gerstner, of the Army, were killed. Lieutenant Murray died at Pensacola, Feb. 16; Lieutenant Post at San Diego, Feb. 9, and Lieutenant Gerstner, Dec. 22, at Oceanside, California.

In 1913, fifty persons were killed in accidents to dirigible balloons. Outside of the war, there were but nine such deaths in 1914.

The following tabular list includes all reported aviation fatalities throughout the world from Jan. 1 to July 31, 1914, and all occurring outside of the zone of war and not due to military causes, for the remainder of the year.

AVIATION DEATHS, JANUARY 1 TO JULY 31, 1914

NAME	PLACE	DATE	MACHINE
Lieut. Méry	Santiago, Chile	Jan. 11	
Military pilot	Kalgan, China	Jan. 11	
Alfred Schweizer	Schleissheim, Germany	Jan. 21	Biplane
George Lee Temple	Hendon, England	Jan. 25	Monoplane
Lieut. Maximo Ramos	Castro-Vientos, Spain	Jan. 26	Biplane
Lancelot Gipps	Lark Hill, England	Jan. 26	Monoplane
— Keybaud	Gusdeleupe, W. I.	Jan. 27	
Lieut. Delvert	Bourges, France	Feb. 2	Biplane
Capt. Niquet			
Emile Brodin	Isle d'Adam, France	Feb. 2	Biplane
		(Died Feb. 3)	
Sellace, military pilot	Munich, Bavaria	Feb. 4	
Raoul de Reals	Villacoublay, France	Feb. 5	Biplane
Lieut. Soeliner	Bromberg, Prussia	Feb. 6	
Non-Comm. officer	Bromberg, Prussia	Feb. 6	
Lieut. Henry B. Post	San Diego, Cal.	Feb. 9	Flying Boat
— Degner	Johannisthal, Germany	Feb. 10	Monoplane
Lieut. J. D. Murray	Pensacola, Fla.	Feb. 16	Flying Boat
Ewart Temple Haynes, passenger	Chichester, England	Feb. 23	Biplane
Capt. Fethi Bey	Between Damascus and Jerusalem	Feb.	
Lieut. Sadik Bey		(Date uncertain)	
Gabriel Wroblewski,			
Pierre Wroblewski,	Ambérieu, France	Mar. 1	Monoplane
also known as Salvez			
Jorge Newberry			
Jimenez Lastia	Near the Andes, Argentina	Mar. 1	Monoplane
Lieut. Eugene Elmer	Aspern, Austria	Mar. 9	Biplane
Serena, passenger			
Capt. Cyril R. Downer	Salisbury Plain, England	Mar. 10	Biplane
Capt. C. R. W. Allen			
Lieut. J. E. G. Burrows	Salisbury Plain, England	Mar. 11	Biplane
Nouri Bey	Jaffa, Turkey in Asia	Mar. 11	
Lieut. Alexander Bella	Santiago, Chile	Mar. 13	
Lieut. de Lesser	Königsberg, Prussia	Mar. 14	Biplane
Elie Hancuille	San Sebastian, Spain	Mar. 16	Biplane
Lieut. Bongard	Metz, Germany	Mar. 18	
Lieut. H. F. Trebley	Salisbury Plain, England	Mar. 19	Biplane
Capt. Andreadi	Sebastopol, Russia	Mar. 21	
M. Barrer	Basle, Switzerland	Mar. 21	
Capt. Reinhardt, passenger	Strassburg, Germany	Mar. 30	Biplane
Lieut. Griffin	Turin, Italy	Mar. 31	Monoplane
Dr. F. M. Bell	Meridian, Miss.	Mar.	
		(Date uncertain)	
Emile Védrières	Rhélms, France	April 1	Monoplane
Pierre Léon Testulas			
Clemens Avligny, mechanician	Châlons, France	April 1	Biplane
Lieut. Valerio Griffin	Mirafiori, Italy	April 1	
Lieut. Langmeyer	Schleissheim, Germany	April 2	Biplane
Sergt. Eric Deane	Brooklands, England	April 8	Biplane
François Verschaeve	Antwerp, Belgium	April 8	
— Reichelt			
Miss Selma Steglich, passenger	Kaditz, near Dresden, Germany	April 10	Monoplane
— Remoine			
— Bouthuyse, passenger (both airmen)	Aspern, near Vienna, Austria	April 12	
Léonce Ehrmann	Bône, Algeria	April 18	
François Deraeye			
Margot Dublin, passenger	Ruc, France	April 19	Monoplane
Raimond Pirschmann	Oberwalkerei, Germany	April 23	Monoplane
Lieut. Napoli			
Lieut. Bastaglini, passenger	Mirafiori, Italy	April 24	Monoplane
Maj. Shigenatsu	Tokyo, Japan	April 25	Biplane
Phillippe Marty	Hendon, England	April 25	Monoplane
Lieut. Mori	Tokyo, Japan	April 27	Biplane
Sergt. Wally	Wiener Neustadt, Austria	April 28	
Charles C. Roystone	Dominguez Junction, Cal.	April 28	Monoplane
Major Mayer	Halberstadt, Germany	May 1	Biplane
H. P. Harris	Akron, Ohio	May 3	Biplane
Lieut. Liachenko			
M. Savitsky	Near Moscow, Russia	May 4	
Lieut. Sainte-Lagüe	Rabat, Morocco	May 5	
Percival Van Ness	Union, N. Y.	May 8	Biplane

NAME	PLACE	DATE	MACHINE
Lieut. Fabre }	Near Stettin, Germany	May 9	Biplane
Lieut. Kurtz }	Alexandro-Mikailowsk, Russia	May 10	
Lieut. Hartman	Farnborough, England	May 12	Biplane
Capt. E. V. Anderson }	North Allerton, England	May 15	
Mechanic Carter }	Sebastopol, Russia	May 16	
Lieut. J. Empson }	Halberstadt, Germany	May 16	Monoplane
A. M. Cudmore, mechanic }	Moosbrunn, Germany	May 17	Biplane
Semichkeurof }	Hechtsheim, Germany	May 17	Monoplane
Lieut. Wiegand }	Moscow, Russia	May 21	
Lieut. Fellinger }	Baku, Russia	May 21	Monoplane
Lieut. Müller }	Wellendorf, Germany	May 23	Biplane
Lieut. Rohde }	English Channel	May 23	Monoplane
Lieut. Kolbe }	Antibes, France	May 30	
Mechanic Mouchin }	Odessa, Russia	May 30	
Ubeiko }	Lago Maggiore, Italy	June 2	Flying Boat
Lieut. Otto Boeder }	Portsmouth, England	June 4	Flying Boat
Lieut. Siegfried Reinhardt }	Dijon, France	June 5	Monoplane
Gustav Hamel }	Dijon, France	June 8	
Alfred Agostinelli }	Toul, France	June 13	Biplane
Lieut. Kousminski }	Jehannisthal, Germany	June 14	
Lieut. Toustanowski }	Chartres, France	June 17	Monoplane
Cevasco }	Eagle River, Wis.	June 17	Flying Boat
Lieut. Thos. F. Creswell }	Gatchina, Russia	June 19	Monoplane
Capt. Arthur Rice }	Gatchina, Russia	June 20	Monoplane
Lieut. Adam Gironne }	Vienna, Austria	June 20	Biplane
Pioneer Rioux }	St. Petersburg, Russia	June 22	Biplane
Lieut. Boissière }	Görries, Germany	June 24	
Corporal Pilot }	Kiel, Germany	June 25	Flying Boat
Pioneer René Cheveau }	Metz, Germany	June 26	Flying Boat
Krieger }	Bitsch, Germany	June 26	Biplane
Maj. Jollen Felix }	Arlon, Belgium	June 28	
Gus. Eckland }	Pskof, Russia	July 2	
Jankowsky }	Soesterberg, Holland	July 2	
Capt. Stoiaikine }	Rheims, France	July 3	Monoplane
Lieut. Pilatz }	Angeles Camp, Cal.	July 4	
Lieut. Blatschka }	Saumur, France	July 6	Monoplane
Lieut. Borislavsky and }	Novara, Italy	July 8	Monoplane
passenger }	Gatchina, Russia	July 9	
Lieut. Kolbe }	Hasselt, Belgium	July 9	
Lieut. Schroeter }	Odessa, Russia	July 10	
Lieut. Grünow }	Schwerin, Germany	July 14	
Maj. Buchner }	Ochakof, Russia	July 15	
Lieut. Lidel }	Saarburg, Germany	July 16	
Capt. Bojaroglo }	Fort Grange, England	July 18	
Lieut. Spandaw }	Brussels, Belgium	July 22	
Corporal G. Godefroy }	Juvisy, France	July 27	Flying Boat
Corporal Emile Mierst }			
Arthur Rybitsky }			
Georges Legagneux }			
Giovanni M. Caviggia }			
M. Camilletti, passenger }			
Lieut. Chenskine }			
Lieut. Hubert }			
Capt. Firsof }			
Lieut. Von der Loehe }			
Lieut. Karl Geigant }			
Capt. Jassipof and mechanic }			
Non-Comm. Officer Wilke }			
Lieut. L. C. Horden }			
Caya de Castilla }			
Lieut. Benjamin Valency }			

AVIATION DEATHS OUTSIDE OF WAR ZONE, AUGUST 1 TO DECEMBER 31, 1914

NAME	PLACE	DATE	MACHINE
Lieut. Robt. Skeene }	Netheravon, England	Aug. 12	Monoplane
Mechanic Barlow }	Bardstown, Ky.	Sept. 4	Biplane
Charles A. Hibbard }	Hendon, England	Sept. 14	
Richard T. Gates }	Pueblo, Colo.	Sept. 16	Biplane
Weldon B. Cooke }	Saint Cyr, France	Sept. 23	
Two pilots (names not given)	Hempstead, Long Island	Oct. 2	{ Homemade Biplane
Wm. Piceller }	Cicero, Ill.	Oct. 9	Biplane
Alphonse Huth }	Woolston, England	Nov. 1	Flying Boat
Mechanic Alston }	Issy-les-Moulineaux, France	Nov. 5	
Capt. Faure }	Aldershot, England	Nov. 5	Biplane
Capt. Remy }	Avon, England	Nov. 5	
E. T. Rusk }	Chesterfield, S. C.	Nov. 13	
Lieut. P. B. Murray }	Buenos Aires, Argentina	Nov. 27	
Frank P. Terrell }	Upavon, England	Dec. 1	Biplane
Altil }	Los Angeles, Cal.	Dec. 2	Monoplane
Lieut. H. R. Fleming }	Near Oceanside, Cal.	Dec. 22	Biplane
Thomas J. Hill }			
Lieut. F. J. Gerstner }			

8891 H
**TABLET TO GERMAN SOLDIERS
WHO FOUGHT FOR AMERICA**

In honor of the German-Americans who fought under the Stars and Stripes during the American Revolution and



Tablet to the Memory of Germans Who Fought for the United States

the Civil War, a bronze memorial tablet was recently dedicated at Dayton, Ohio. The event was participated in by nearly 2,000 members of German societies, and was held at Memorial Hall. At the bottom of the tablet are the words, "Our New Fatherland."

8955 H
**PURIFYING ARTIFICIAL GAS
WITH ELECTRICITY**

Electricity is being employed with success at a Detroit coke oven for the purpose of removing tar from artificial gas in the purifying process. The gas is passed through a highly ionized field,

which is produced by a high-tension discharge of current ranging as high as 80,000 volts, with the result that the tar forms in large drops which are then easily separated. There are no high-tension leads exposed, since the ionizer contains the transformer.

8980 H
**ATLANTIC COAST IS SWEEPED
BY SEVERE STORM**

The east coast from New England to Virginia was battered, its villages inundated, and many of its most fashionable resorts devastated early last December when a severe northeasterly gale lashed the Atlantic Ocean and rolled up the highest tide that has swept into New York Harbor in more than a decade. Shipping was paralyzed and liners were forced to remain outside of Sandy Hook and battle against the waves, while telegraphic communication was interrupted, and damage aggregating hundreds of thousands of dollars done to property.

The full force of the ocean bore against the New Jersey shore. At Seabright heavy waves broke across the low, narrow beach between the sea and the Shrewsbury River, completely obliterating many of the beautiful summer residences situated there. At Sandy Hook the wind reached a velocity of 68 miles an hour. Across the bay the shore line of Staten Island was strewn with debris from wrecked boats. At Coney Island, Brighton Beach, and at Sea Gate, residences and buildings were demolished. At Rockaway Beach, on Long Island, the waves rolled more than 25 ft. above the high-tide mark, while points on Long Beach, on the Jersey coast, suffered extensively. Along the beach here for miles there is a marginal ledge of land, much of it quite low and practically all of it backed by narrow bays, which was subjected to the fury of the sea. In some sections of Atlantic City water covered the streets to a depth of four feet. Boats in the Delaware River suffered, and business districts along the water front at Philadelphia were inundated. The storm lasted for several days.



The Above Photograph Gives a Conception of How Incapable the Sea Walls Were of Withstanding the Force of the Waves at Some Points. At the Left and below is shown the Wreckage of Summer Cottages at Seabright, N. J., Where the Storm Worked Extensive Damage



PHOTO COURTESY, INTERNATIONAL NEWS SERVICE

Houses along the Beach at Sea Gate, L. I., were Washed into the Sea after the Bulkheads Gave Way

200 Williams St., N. Y. City

 Donor *W. C. Sawyer* 626 S. Hope St.
 anyone to *Los Angeles Calif.*
 W. C. 398
 B 526/15 ✓
 POPULAR MECHANICS



CALIFORNIA SENDS FOOD TO STARVING BELGIANS

The Pacific coast responded with characteristic generosity to the appeal for aid for the Belgian war sufferers. The photograph shows the first relief ship from California starting on its voyage by way of the Panama Canal.

8988 *m* FLOATING CRANE BUILT FOR PANAMA CANAL WRECKED

The jib of the floating crane "Ajax," which is one of the two powerful floating cranes built for handling the biggest and heaviest pieces required in repairing the Panama Canal locks, collapsed while lifting a test load at Cristobal, Dec. 7, 1914. The crane was rated for loads varying, according to the reach of the jib, from 100 gross tons to 250 gross tons, but before being accepted by the government it was required to lift loads 20 per cent in excess of the rated load for each reach. According to reports, the collapse occurred when the jib was working over the side of the pontoon at a reach of 81.6 ft. The rated load for this reach is 100 gross tons, and this with the 20-per-cent overload required in the test made an actual load of 120 gross tons. This load, consisting of a solid block of concrete weighted with steel rails, had been lifted about 4 ft. above the ground when the steel framing of the jib collapsed and fell, the nose of the jib burying itself several feet in

the ground. The loss due to the collapse is estimated at from \$100,000 to \$150,000. The pontoon and tower portion of the crane were not damaged. The only man injured was a West Indian laborer who was riding at the top of the jib, and who escaped with only slight injuries by jumping when the jib started to fall. This crane and its mate, the "Hercules," were built in Germany and are said to be the largest floating cranes in existence. Each has a maximum rating of 250 tons at a reach of 21 ft. over the end of the pontoon, or 22.3 ft. over the side. With the 20-per-cent overload for testing, this makes 300 gross tons, or 672,000 lb., as shown in the illustration.

¶The last legislature of the state of Missouri worked out a good-roads plan which contemplates connecting every county seat by improved highways. A motor road between St. Louis and Kansas City, Mo., is being built.



Wreck of the Floating Crane "Ajax," the Steel Jib of Which, a Framed Structure Built Up of Heavy Structural Materials, Collapsed While Undergoing the Tests Required by the Panama Canal Authorities. The Test Load, Consisting of a Solid Block of Concrete Weighted with Steel Rails and Weighing 120 Gross Tons in All, was being Lifted at a Reach of 81.6 Feet when the Jib Buckled and Fell. The Test

Load Required for the Shortest Reach of the Jib was 300 Gross Tons, or 672,000 Pounds

SCENES OF ACTUAL FIGHTING IN TRENCHES



COURTESY, INTERNATIONAL NEWS SERVICE
Belgian Soldiers Using a Hyperscope, Which Allows Them to Watch the Enemy without Exposing Themselves



COURTESY, INTERNATIONAL NEWS SERVICE
German Infantrymen under Shelter on the Belgian-Dutch Frontier Keeping a Steady Fire on the Enemy



COURTESY, INTERNATIONAL NEWS SERVICE
British Soldiers in Belgian Trenches Using Field Glasses to Find the Position of German Sharpshooters

ON BATTLE FIELDS OF WAR-RIDDEN EUROPE

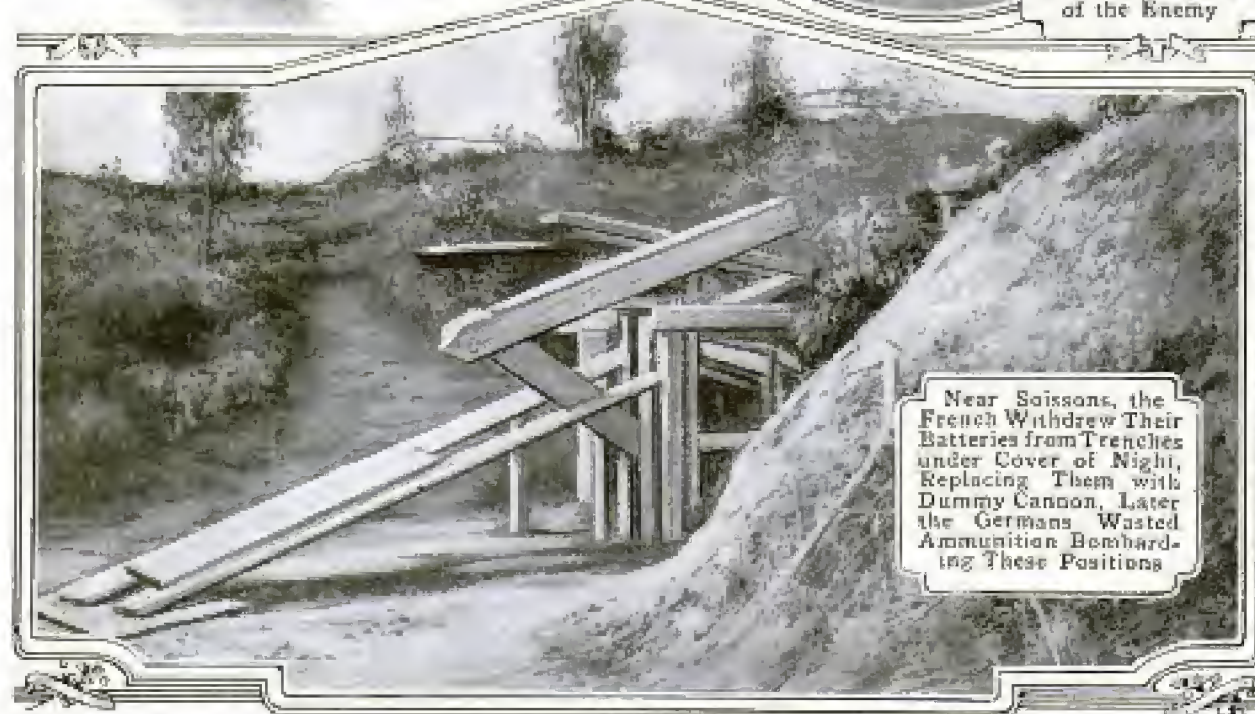


TIME-WORN RUSES OF WAR THAT STILL WORK



Pieces of Large Water Pipe were Used Here by the Germans to Simulate a Silenced Battery of Artillery. Had the French Attacked the Position, They would have been Trapped by Fire from Hidden Guns

Dummy Cannon, Made of Old Cart and Empty Barrel, Placed by Germans to Deceive Aerial Scouts of the Enemy



Near Soissons, the French Withdrew Their Batteries from Trenches under Cover of Night, Replacing Them with Dummy Cannon. Later the Germans Wasted Ammunition Bombarding These Positions

WITH THE RED CROSS IN FIELD AND HOSPITAL



PHOTO BY PAUL THOMPSON

Dead and Wounded Soldiers are Found Where They would be Missed Entirely but for Hospital Dogs



This Illustration Shows the Character of Uniforms Proposed for the Use of Women Field Nurses of the German Red Cross. The Color of the Garments is the Same Gray as That of the New Service Attire of the Soldiers



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The Small Red Cross Flag Seen in the Background Marks the Site of the Japanese Red Cross Station near Tsingtau. The Geneva Insignia is above Treason a Kite String



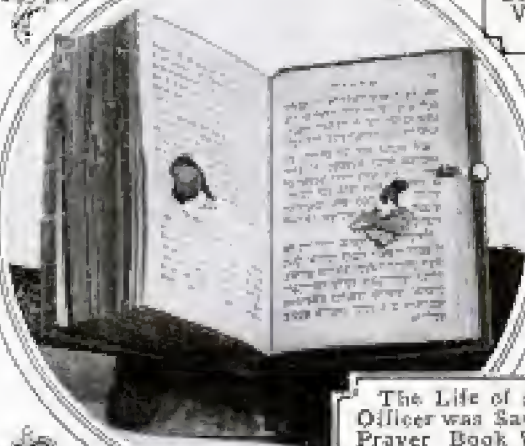
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Interior of Diamond-Cutting Establishment at Amsterdam Which has been Converted into a Hospital for Wounded Soldiers

THINGS SEEN IN THE WAKE OF EUROPE'S WAR



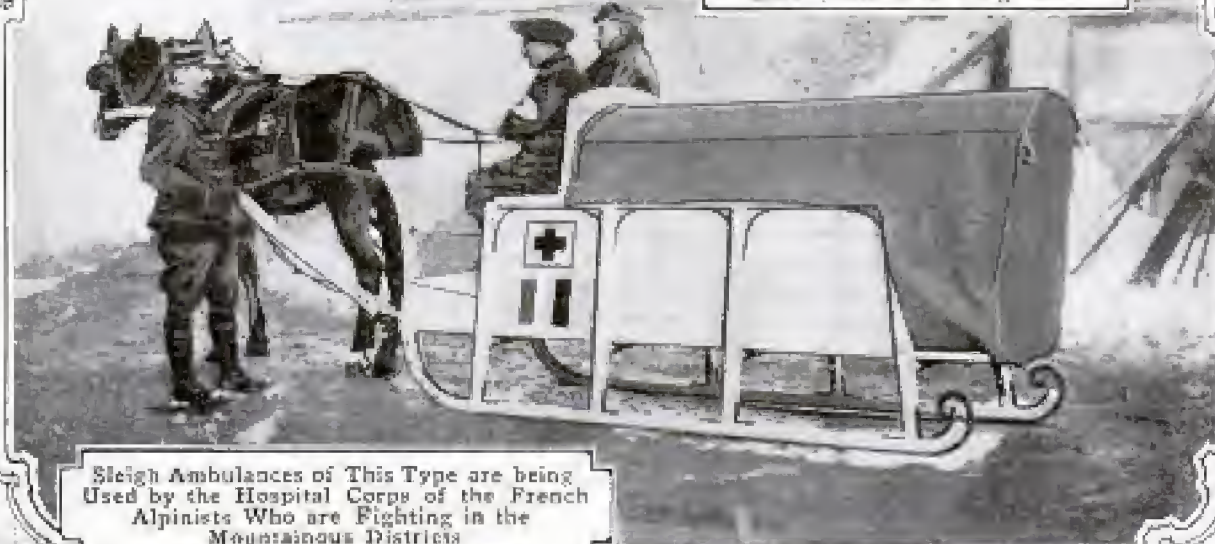
Interior of a British Ambulance Train, Many of Which have been Fitted Out for the Government by the Various Railway Companies



The Life of a German Officer was Saved by This Prayer Book Which was Struck by Shrapnel



With One Pair of Hands between Them, These Two Wounded French Soldiers are Attempting to Assist Each Other Roll a Cigarette



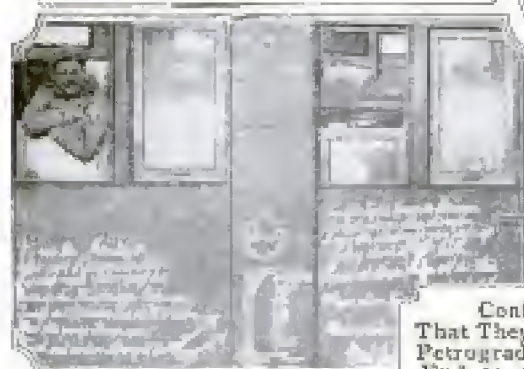
Sleigh Ambulances of This Type are being Used by the Hospital Corps of the French Alpinists Who are Fighting in the Mountainous Districts

GERMAN MEDIUMS OF TRANSPORTATION IN WAR

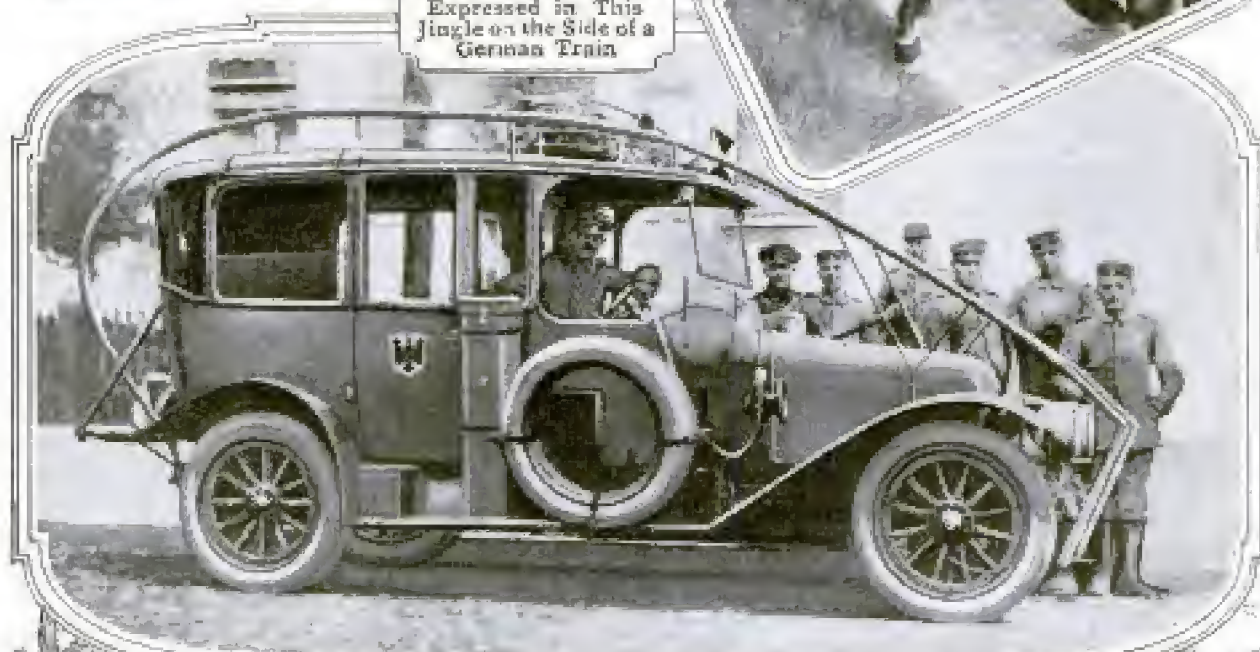
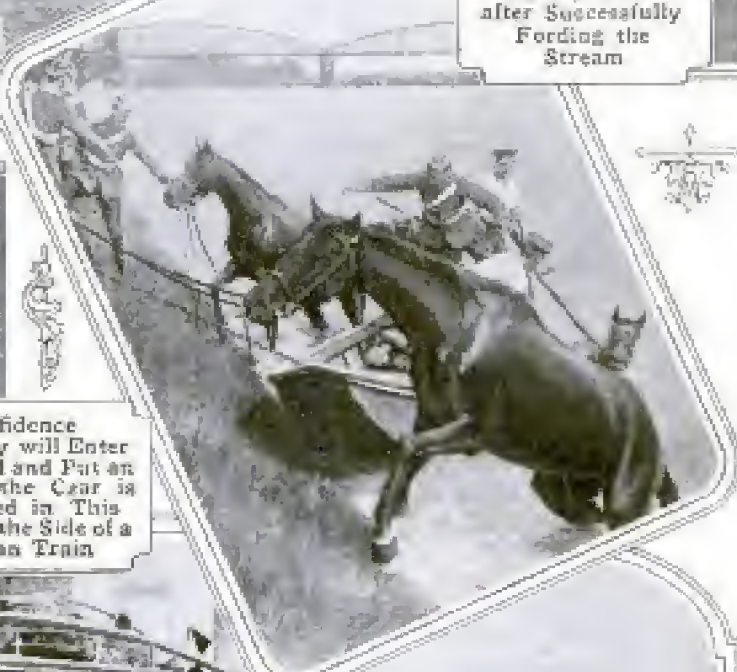


Detachment of German Cavalrymen Crossing a River. The Horses Held Alongside are Made to Assist in Propelling the Pontoon

Landing the Cavalry Horses on a Steep Bank after Successfully Fording the Stream



Confidence That They will Enter Petrograd and Put an End to the War is Expressed in This Jingle on the Side of a German Train



One of the German Motor Cars, Fitted with Wire Guards, Which is being Used by Kaiser Wilhelm While at the Front

HOW BRITISH TROOPS ARE FIGHTING OFF COLD



COMBUSTIBLE
LUMINATING & ILLUMINATING

At One of the
Kitchens in the
Trenches Where
Food is being
Prepared for the
Soldiers on the
Firing Line

A Lean-To Occupied by Several
Officers of a Scotch
Regiment
Wintering in the
Western Theater
of War

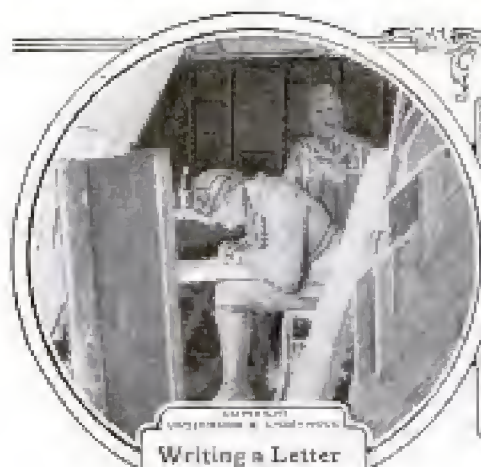
BARRETT
LITHOGRAPH & ENGRAVER

Fighting Off
the Sting of Zero
Weather and
Attacks of the
Enemy in Shanties
and Trenches Built
in the Mountains
of Argonne

CORRECTION, DUNN & SONS

Dugouts in Which Soldiers
are Spending the Cold Months
behind One of the En-
trenchments on the Western Battle
Front. Even in This Well-
Protected Camp Hardships
of Winter are Apparent

IN THEIR WINTER QUARTERS ON THE CONTINENT



Writing a Letter to the Home Folks in One of the British Dug-outs on the Battle Front



British Troops, Encamped on the Western Battle Front, Swathed in Greatcoats to Withstand the Winter Storms



In Some Places on the Firing Line the Conditions to Which the Soldiers are Subjected Are Wretched, the Floors of the Trenches being Covered Ankle-Deep with Mud or Half-Frozen Slush

This British Trench, Which from a Short Distance Is Almost Invisible, is Built for a Long Stand. The Side Protections Shield the Men from Bursting Shells and Shrapnel Fire

ON FROZEN AND SNOW-COVERED FIRING LINES



One of the Servian
Fortress Batteries
Which has stood
Out against the
Austrians. Seen
during a lull in the
fighting



Detachment of
Servian
Infantrymen
Advancing under
Fire on a
Snow-Covered
Battle Field



Heavily Clad
Russian Artillerymen
in Action on a Storm-
Swept Hill between
the Vistula and
the Warthe during
Severely Cold
Weather

BITTER COLD ADDS TO HARDSHIPS OF WAR



French Infantrymen near
Ypres Wrapped in
Blankets and Huddled
Together before a Fire to
Fight Off the Cold



Above:
French "Chas-
seurs Alpins" on
Skis Resting While
Making Their Way
through Mountainous
Country. Left: Ger-
man Landsturm
Patrolling the
Frontier



EVERYDAY LIFE OF THE MEN AT THE FRONT



Soldiers of the Kaiser Preparing Breakfast on the Field with Utensils Carried in Their Haversacks



Indian Bakers on the Field Making Bread for the Troops Fighting in the Trenches



An Improvised Outdoor Barber Shop in a German Army Camp. Often Accessories are Noticeably Lacking, as in This Case a Razor is being Strapped on the Shoulder Strap of a Rifle

PATHETIC SIDE OF WAR SEEN BY THE CAMERA



Lowering a Wounded Zouave into the Hold of One of the Hospital Barges on the Seine Which have been Fitted Out by the Women of France

Each One of These Fourteen Brass Helmets Marks the Alien Grave of Its Wearer, a German Soldier Who Fell at Charleroi

A Prussian Family, Returning Home after the Russians had been Repulsed, Found Only Charred Bricks and Crumbled Walls

PHOTOGRAPHED BY THE LONDON PHOTOGRAPHIC COMPANY

"TO ARMS!" BRITAIN'S APPEAL TO ITS YOUTH



WAR MOTOR CARS, THE BATTLESHIPS OF LAND



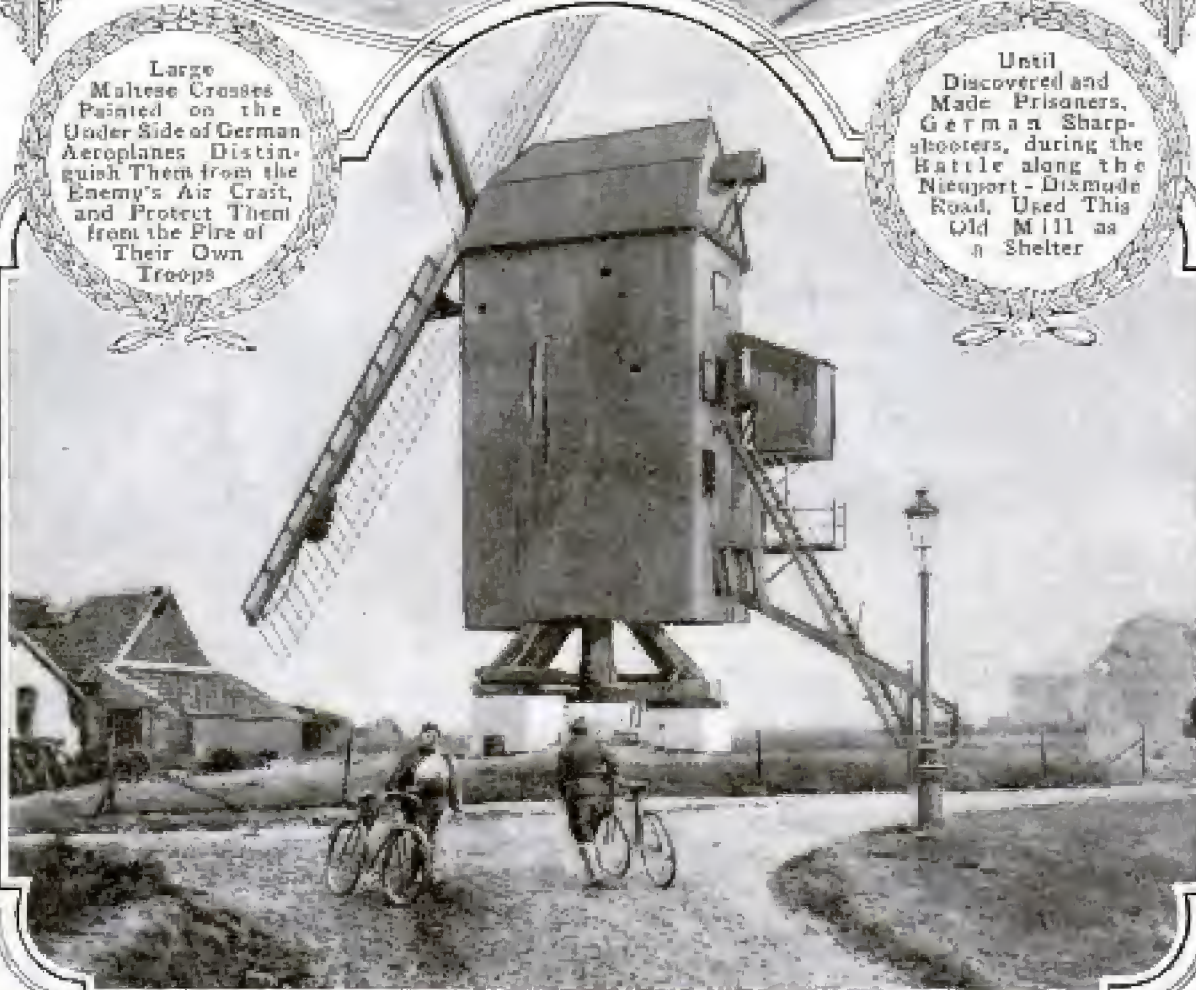
WITH GERMANY'S AIRMEN AND SHARPSHOOTERS



COURTESY INTERNATIONAL NEWS SERVICE

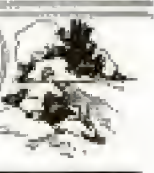
Large
Maltese Crosses
Painted on the
Under Side of German
Aeroplanes Disting-
uish Them from the
Enemy's Air Craft,
and Protect Them
from the Fire of
Their Own
Troops

Until
Discovered and
Made Prisoners,
German Sharp-
shooters, during the
Battle along the
Niempert - Dismude
Road, Used This
Old Mill as
a Shelter



COURTESY INTERNATIONAL NEWS SERVICE

SCENES IN BRITISH CAMPS ON THE CONTINENT

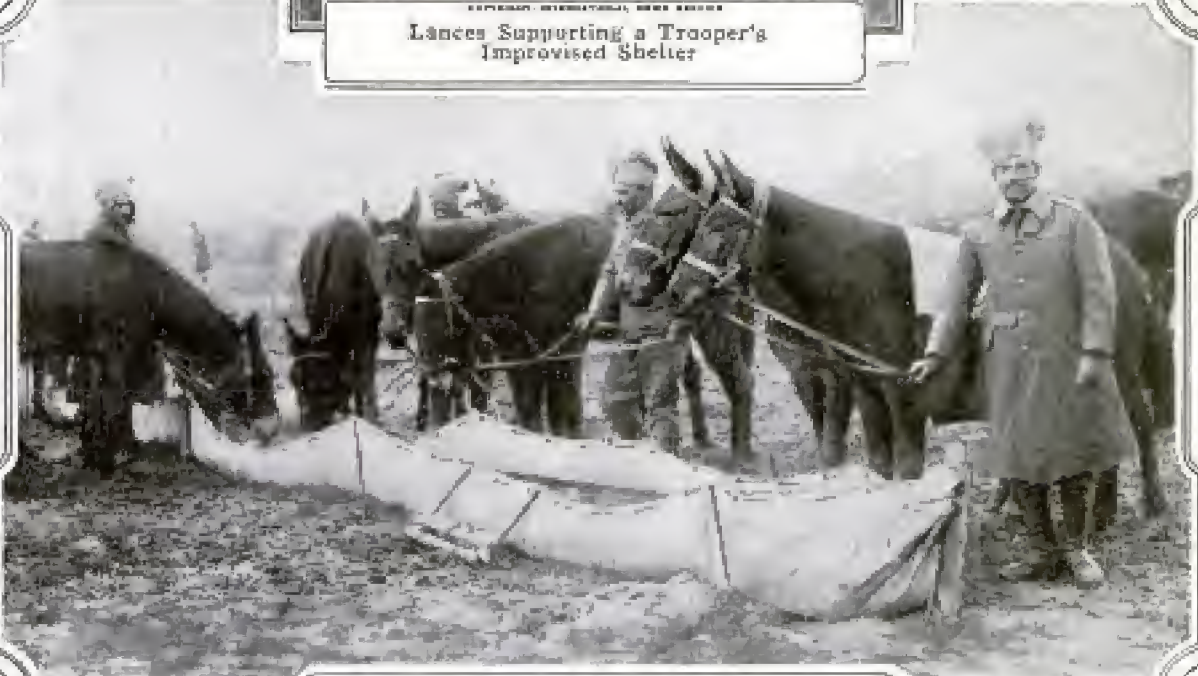


Below:
Indian Troops
Watering Their
Pack Mules at the
End of a March. The
Trough is Made of
Canvas and Held
in Shape by
Stakes



Lances Supporting a Trooper's
Improvised Shelter

Some
Idea of What
It Means to Hold
Ground in the Face
of a Bayonet Charge
is Conveyed by the
Above View of the
"London Scottish"
in Action

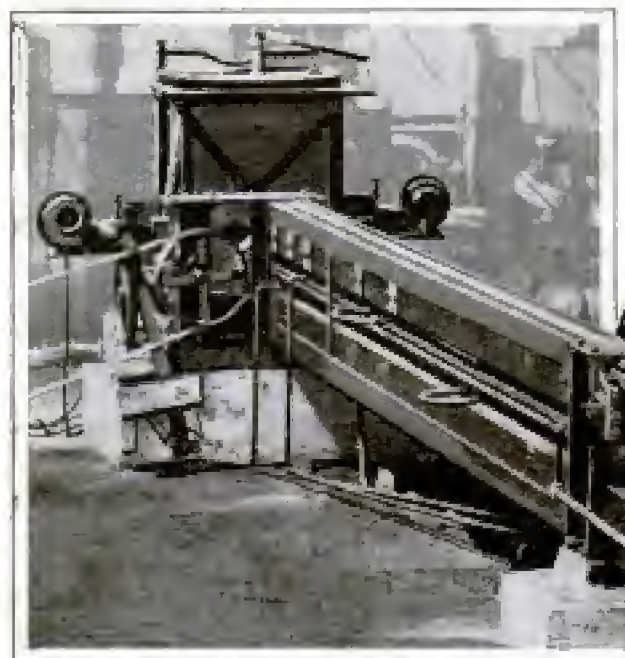




Curious Arrangement of Grades That Resulted from Building a Bridge for One Location and Then Erecting It, with Spans Transposed, on Another Site

OLD BRIDGE WITH MIXTURE 8799m OF GRADES

A curious old bridge in Scotland that is soon to be replaced by a concrete structure comprises three spans built of cast iron over the River Esk, at Longtown. This bridge is supposed to have been built for another location, and when it was erected on the present site it was found necessary to transpose the spans, which resulted in placing the high span, originally intended for the center, at one end of the bridge. The structure now has a striking succession of up and down grades, as will



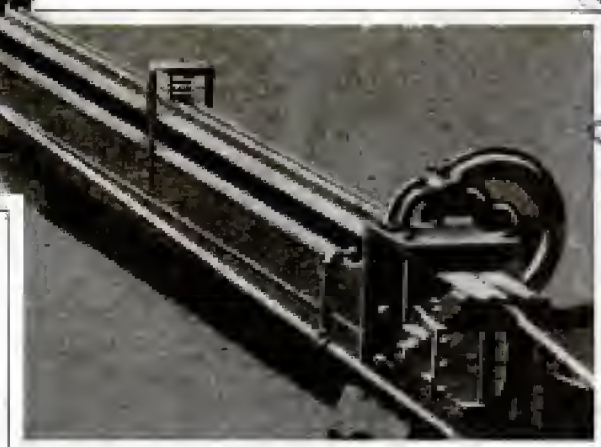
Machine for Casting Metal Rods: The Metal, in Molten Shape, Enters at One End of the Machine and Emerges from the Other End as a Solid Rod

be seen from the illustration. The high span, which is the one at the near end of the bridge, is 150 ft. long, while the other two ends have a length of 105 ft.

NEW MACHINE SIMPLIFIES MAKING OF METAL RODS

By means of a new machine that is being introduced in the metal-working industry, rods of copper, brass, and aluminum are cast from the molten metal at one operation, in contrast with the present process of casting into bars, then heating and passing through the rolling mills. The essential feature of the machine comprises two endless chains of mold blocks which are in sections and join in center alinement in a straight line. These mold blocks form a traveling mold orifice into which the liquid metal flows from the melting furnace. As the liquid travels with the mold blocks, it solidifies and emerges from the bore of the machine as a solid rod. Since the chains are endless the rods may be produced in any desired length.

Changes in section are made by changing the mold blocks. The machine occupies a floor-space of only 150 sq. ft. A vertical machine on the same principle has been built.



United Aluminum Ingots
323 Producers Exchange
N. Y. C.

NEW LENSES THAT SHUT OFF CONTINUOUS-FLIGHT RECORD

8771 HARMFUL RAYS

Optical lenses that cut off all the harmful ultraviolet rays and 40 per cent of the heat rays while letting through 84 per cent of the visible light rays have been invented by Sir William Crookes, the famous English physicist, and are now being manufactured in America. One type of this new glass is of a neutral tint, so pale as to be almost colorless, while another is of a medium tint. The quality of filtering out the ultraviolet rays is due to various metallic oxides of chromium, uranium, etc., and certain rare earths, which are introduced in the process of manufacture.

8572 FOR AMERICA BROKEN

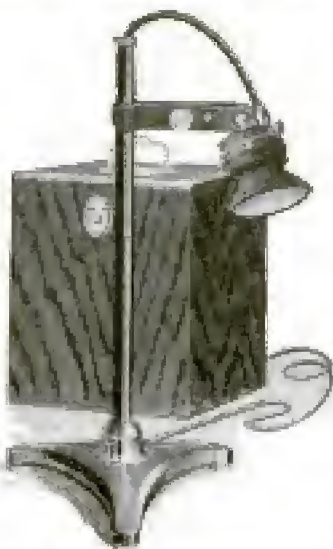
The American record for continuous long-distance flight was broken in



New Type of Monoplane in Which the American Continuous-Distance Record was Broken

ELECTRIC LIGHT WITHOUT A CENTRAL STATION

8605 A new electrical invention on which patents are now pending is an electric table lamp which operates on dry batteries. The cost of operation is said to be exceedingly small, since the lamp burns from 200 to 300 hours on one set of batteries. The current is supplied by four dry cells.



These are installed in a compact case equipped with a handle, and are connected with the lamp by an ordinary insulated wire.

the fall of 1914, when W. C. Robinson in a monoplane of his own design and manufacture flew from Grinnell, Iowa, to Kentland, Ind., a distance of approximately 365 miles, without descending. The airman had started for Chicago, but lost his way in a dense fog. The previous record for continuous flight in this country was made by C. M. Wood, who flew from Westbury, Long Island, to Gaithersburg, Md., a distance of 264 miles, on Aug. 9, 1913. The new type of monoplane in which this latest flight was made is so constructed that the pilot can see the ground continuously, the wings being so set with reference to the body as to provide a clear space for vision.

VILLAGE THAT HAS TWENTY MINUTES OF SUNSHINE

8743 In the village of River Portal, Colo., there is only 20 minutes of sunshine each day. This unique condition is due to the fact that the village is located at the bottom of the Gunnison Cañon, where, on account of the lofty and pre-

*Submitted by Nichols -
Finn Advertising Co.,
222 So. State St.*

*H. E. Zimmerman
Int. Morris, Ill.*



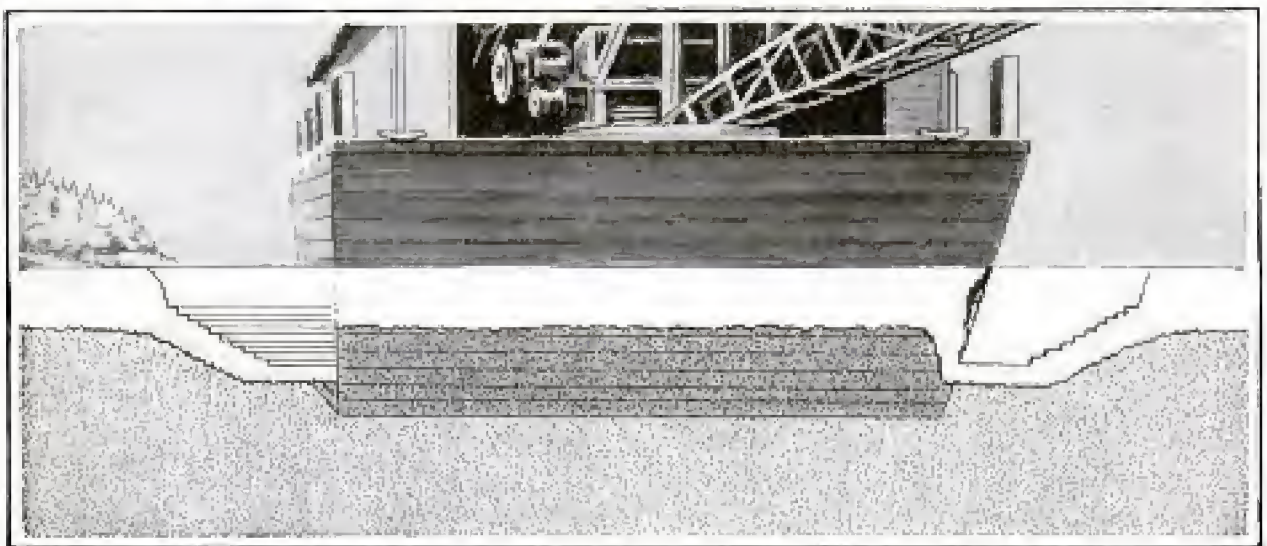
Nestling in the Bed of a Cañon Half a Mile Deep, This Village Gets Only 20 Minutes of Sunshine on the Longest Summer Day

cipitous walls and the narrowness of the cañon, the sunlight can reach to the bottom only during the interval from 11:20 to 11:40 in the morning. The village was built in connection with the construction and operation of the great irrigation tunnel that takes the water from the Gunnison River westward under the mountain range to the Uncompahgre Valley. It can only be reached by a roadway dug out of solid rock down the side of the cañon.

To facilitate the passage of ships through the Panama Canal a special telephone system has been installed connecting all the points of control along the canal.

ICE COFFERDAM USED IN 8444 REPAIRING DREDGE

Forming an ice cofferdam inclosing the part to be repaired was the novel method used in getting to a leak 34 in. below the water line of the United States dredge "Warroad" while it was laid up for the winter in Lake of the Woods on the border between Minnesota and Ontario. When the ice had formed to a depth of 18 in. a trench 20 ft. long, 3 ft. wide and 12 in. deep was dug in the ice alongside the dredge, and on each following day when the temperature had been below zero the night before, this trench was deepened from an inch to an inch and a half, care



Ice Cofferdam Formed alongside a Dredge by Gradual Deepening of Trench in the Ice

Engineering News
7-23, 1914

being taken to leave about five inches of ice under the trench at each cutting. With this slow deepening of the trench the walls were given a chance to freeze to a safe thickness so that the ice served as a perfect cofferdam during the work of repairing the leak. While this work was being done the temperature dropped as low at times as 45° below zero.

HOW PLUMBAGO IS MINED

8654m IN CEYLON

In spite of the fact that Ceylon is one of the largest plumbago-producing countries in the world the methods of mining and handling this mineral are crude and comparatively inefficient. In one of the principal mines the vein is located 648 ft. below the surface, and since it is only 10 in. thick, great quantities of rock must be taken out to give access to the mineral. The plumbago is cut out by drills, and the rock is drilled and blasted. Both the plumbago and the rock are lifted to the surface in 10 "dabara" stages. The material is placed in a bucket and wound up by the dabara to the first stage. The bucket is then detached from this dabara and attached to the second dabara, which takes it to the second stage, and so on, until the top is reached. The plumbago is stored below as it is mined, and is taken to the surface once a month. In some of the mines now being developed more efficient methods of hoisting are used. In one of these, a straight incline leads from the main pit, 96 ft. below the surface, to the vein, which is 558 ft. below the surface. The material is hauled up the incline by one cable and is then taken to the surface by a hoist.

SIGNAL LANTERNS IN THE

8453m FOREST SERVICE

One of the latest methods of night signaling in the national forest service is that of suspending two lanterns from the cross arm of a mast erected on top of the signal station and raising and

lowering these lanterns in accordance with the wigwag code. Not only arbitrary signals are sent in this way, but



Forest Officer Signaling with Lanterns from the Top of a Range-Finder Station

complete messages as well. This method of communication is available at any time for night signaling, and is designed particularly for emergency use when the telephone is out of commission.

Statistics covering the first six months of 1914 show that diamonds aggregating 2,262,817 carats and valued at more than \$22,000,000, were produced in South Africa. Compared with the same period of the previous year, the production represents a decrease.

Bristow Adams
U. S. Forest Service
Wash. D. C.



The Bulb of a Common Variety of Kelp



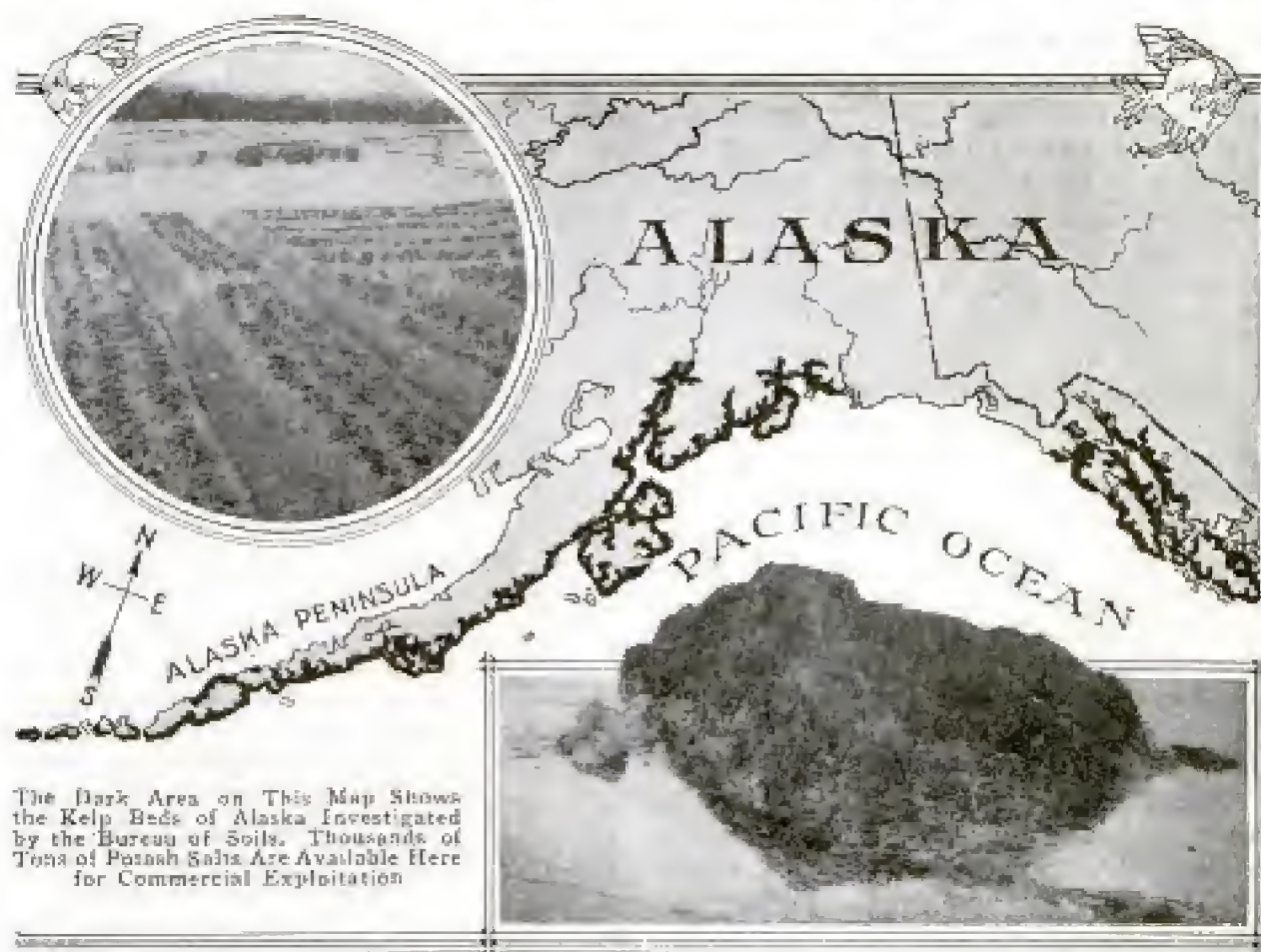
This Kelp Plant Is 60 Feet Long. It Grows Prolifically in Northern Waters



Kelp of This Kind is being Gathered along the California Coast and Used for Commercial Purposes



This Gives Some Idea of the Length of the Rope-like Stipes of Many of the Heavy Seaweeds



The Dark Area on This Map Shows the Kelp Beds of Alaska Investigated by the Bureau of Soils. Thousands of Tons of Potash Salts Are Available Here for Commercial Exploitation

In the Circle is Shown an Alaskan Kelp-Fertilized Truck Garden. Below: A Rock Covered with Alaria

8860 GIANT KELP BEDS OF THE PACIFIC H CONTAIN VAST WEALTH IN POTASH

PARTLY because the European war has checked the importation of potash from Germany, and partly because of the results of recent scientific inquiry, interest is being manifested in the conservation and utilization of the giant kelp beds of the Pacific coast and Alaskan waters. It is now a fairly well established fact that the inexhaustible supply of marine vegetation off the west coast of the United States holds this country's largest store of potassium salts.

In numerous places, as far north as the Aleutian Islands, kelp grows prolifically and is available for commercial purposes. In view of the fact that comparatively little use has been made of it by Americans, it is interesting to note that the natives of the south shores of Alaska and its near-by islands

have for years employed it in a crude way as a fertilizer. As a result, the gardens in this section have thrived remarkably well. In the cultivation of potatoes, for instance, it is a common practice to bury a thick layer of seaweed in the ground before the planting. Certain varieties of kelp grow abundantly where the water is less than 10 fathoms in depth, the tide strong, and the bottom rocky. Most of these are anchored to the rocks by means of a spreading growth, attached to which is a long ropelike stem, known as the stipe, which terminates in a bulb from which the large leaves sprout. The stipes, which are strong and flexible, have been used much by the Indians as fishing lines and rope, while the bulbs are frequently employed as bottles. The plants are very

hardy, as is evinced by the fact that at the mouth of the Karluk River the employes of a salmon cannery have been trying for years to root them out, on account of their interference with fishing, and have never been successful.

Surveys which have lately been completed by the Bureau of Soils of the Department of Agriculture in the search for new sources of potash, show that the annual yield of kelp, commercially available, actually offers a greater quantity of this essential fertilizing element than is now being consumed by the entire world. With this fact determined, working maps of nearly all the groves, from the Cedros Islands to the Shumagins, off Alaska, have been prepared. These show that the aggregate area of the field amounts to approximately 400 square miles, practically all of which is easily accessible.

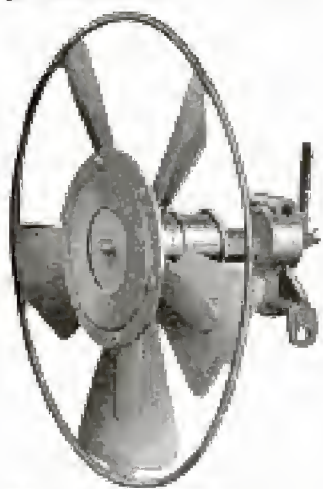
The development of these valuable resources, it is declared, is commercially feasible. From one ton of thoroughly air-dried kelp, in excess of other by-products, there is an assured available yield of at least 500 lb. of

pure potash salts and three pounds of iodine. In the comparatively short time that studied attention has been paid to the question, at least a dozen different companies have been organized on the Pacific coast to develop this new industry. Most of the concerns are located in the vicinity of Puget Sound, while there are others planning to utilize the kelp available at Long Beach, San Diego, Point Firmin, San Pedro, and elsewhere.

The potential value of the kelp off the coast of Alaska alone has been shown to be immense. The government surveys of the southeastern and southwestern coasts, which were made during an extensive expedition a short time ago, estimate the possible annual yield of pure potash salts from the seaweeds in this region at more than 80,000 tons, while the total Alaskan kelped area is placed at about 160 square miles, which offers a yearly store of about 734,000 tons of potassium chloride. The kelp of the northern waters was found to be richer in valuable chemicals than that of the southern.

COMBINATION HORN AND FAN FOR MOTOR CARS

One of the newest accessories for motor vehicles is the fan-horn, a combination of a cooling fan and a horn.



The horn is at the center of the fan and is in the form of a diaphragm of steel. At the front it is open, so that the sound waves may emanate when it is vibrated. The vibration is caused by a stationary anvil with teeth which cause the

diaphragm to vibrate when the fan is rotating. The anvil is brought into

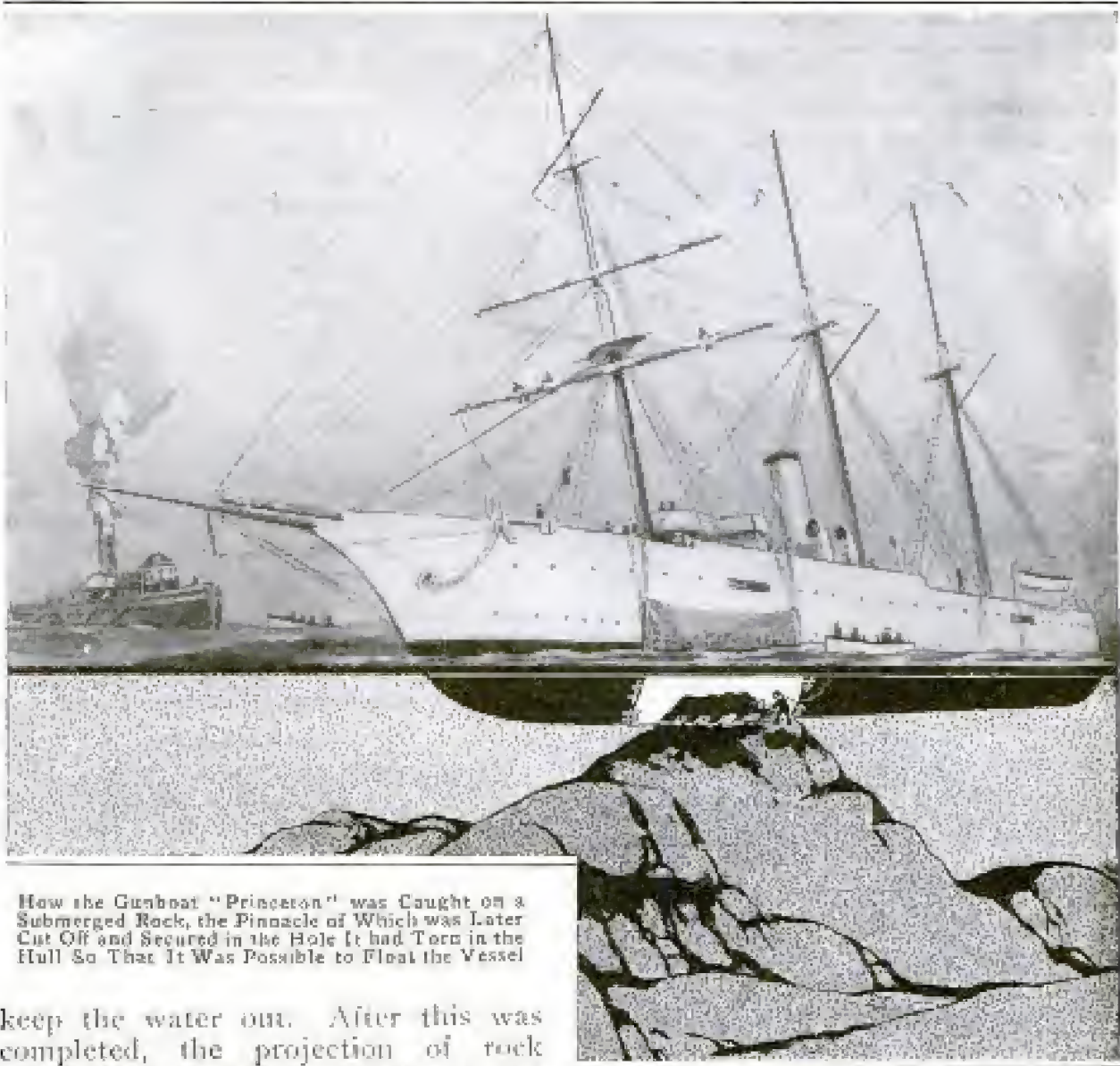
contact with the diaphragm by the pressure of a button. The tone produced is like that of an electric horn, and can be varied in pitch by varying the pressure on the button. When the motor is not running the horn cannot be sounded. This prevents children from sounding the horn when the car is left standing.

GUNBOAT IS SAVED BY ROCK THAT DISABLED IT

A very unusual engineering feat was accomplished recently when work was undertaken to save the United States gunboat "Princeton," after it had been disabled by striking an uncharted, submerged rock in the harbor at Pagopago, Samoa. A pinnacle of the rock which was struck entered the hold of the vessel, filling the rent torn in the hull and preventing a further movement of the boat. By employing canvas and plank sheathing it was possible to

Outlook

*Sold by Engineering Equipment Co.,
Indianapolis, Ind.*
*Chester S. Richer
State Life Bldg,
Indianapolis, Ind*



How the Gunboat "Princeton" was Caught on a Submerged Rock, the Pinnacle of Which was Later Cut Off and Secured in the Hole It had Torn in the Hull So That It Was Possible to Float the Vessel

keep the water out. After this was completed, the projection of rock which had pierced the boat was cut from its ledge, and by reinforcing and cementing made fast so that it completely plugged the hole it had made. The "Princeton" was then able to make its way to a dry dock where it could be repaired.

PROCESS FOR MAKING TRUE PORCELAIN TILE

The difficulties involved in making a true porcelain tile are apparently overcome by a process that has just been developed. The tile made by this process consists of a thin layer of porcelain faced with a translucent glaze and backed with a stoneware body, the stoneware constituting about $\frac{1}{4}$ of the tile. The composition of the different

materials is such that they have exactly the same degree of shrinkage, so that there is no danger of warpage in the kiln, and after being fired, the materials are bonded together to form one compact and solid body. The finished tile presents, under the white translucent glaze, an impermeable layer of true porcelain backed by a gray, vitreous stoneware body. No lead is used in the process, and it is therefore free from any danger of the lead poisoning that characterizes the manufacture of some classes of glazed tile.

During the 12 months ended June 30, 1914, the government propagated and distributed approximately 4,000,000 food and game fish.

~~Frank A. Parker
1/2 St. Blake
N.Y. City~~

Inventor: Chas. Stegmayer.
Mfr.:
Clifton Porcelain Tile Co.,
51 Clifton, N.Y.

m
8463
**APPARATUS FOR RECORDING
TELEPHONE CONVERSATION**

An interesting addition to telephone equipment is an apparatus, recently invented, by which telephone conversation may be recorded for future reference. This apparatus consists of a small metal box which contains a set of dry batteries and an extremely sensitive telephone transmitter. Both ends of the telephone conversation are taken up by this receiver and retrans-



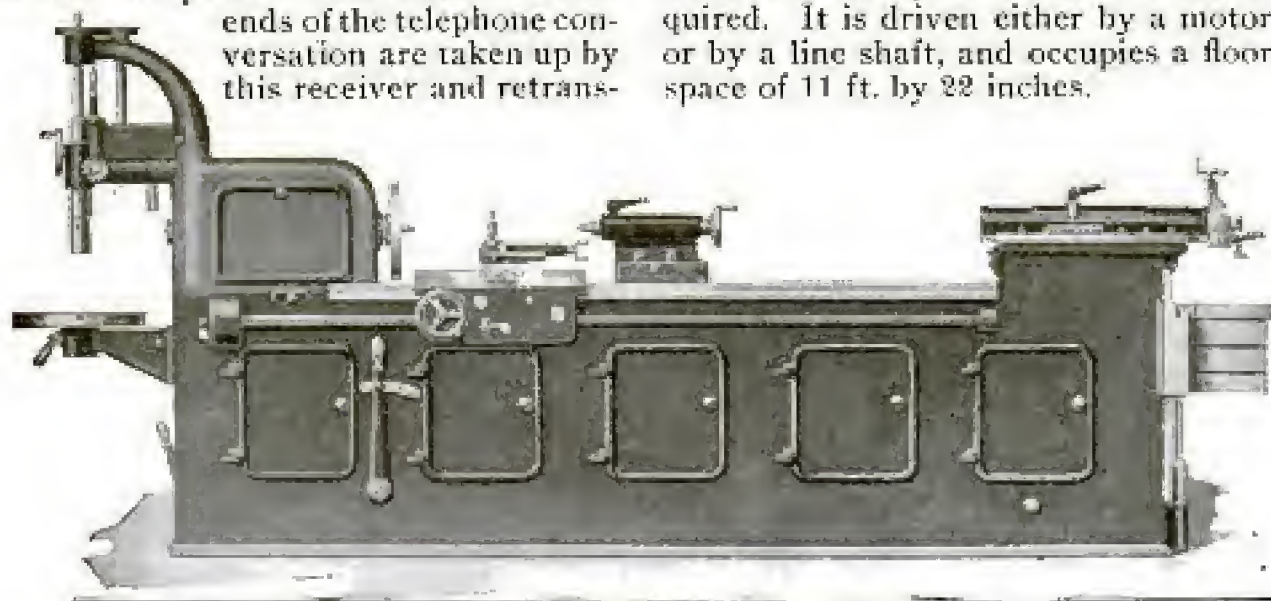
Telephone Recording Apparatus as Used with an Ordinary Desk Telephone

sations may be recorded for future reference. This apparatus consists of a small metal box which contains a set of dry batteries and an extremely sensitive telephone transmitter. Both ends of the telephone conversation are taken up by this receiver and retrans-

mitted by the dry batteries to an electric recorder that acts on the wax-cylinder record of a phonograph. In using, the regular receiver of the telephone is taken from the hook and placed, with the earpiece down, on the socket of the recording instrument, and in this position sends to the transmitter within the box all sounds that pass through the telephone. To use the telephone receiver in this way, it must be wired to both circuits in the telephone. The user then talks into the telephone in the usual way, but uses a small receiver attached to the recording instrument. The phonograph can be started and stopped at will by means of two push buttons, so that no part of the record need be used up during long pauses in the conversation or while "central" is making the connection. The idea is to file the wax cylinder as a permanent record.

8396 m
**A MACHINE SHOP IN ONE
MACHINE TOOL**

A lathe, drill press, milling machine, and keyseater are all included in one universal machine tool that has just been brought out. This machine is intended for tool rooms, steamships, garages, and establishments generally where special construction or repairs are to be carried out, but where a regular machine-shop installation is not required. It is driven either by a motor or by a line shaft, and occupies a floor space of 11 ft. by 22 inches.



This Machine, Which Occupies a Floor Space of 11 Feet by 22 Inches, Comprises a Lathe, Drill Press, Milling Machine, and Keyseater

84
Canadian Linderman Co.,
Woodstock, Ont. Canada

Photo - Underwood & U. 417 Fifth Ave. N.Y.C.

See Data - extracts from various newspapers &

THE SPY AND HOW HE WORKS

Risks Run and Ruses Resorted To by the Men Who Work within
the Enemy's Lines in the Service of Their Country

S 748 H

By SEARLE HENDEE

WHEN the cables carried the news that Carl Hans Lody, a former resident of Omaha, had been shot as a spy in the Tower of London, a grim picture of the ugliest, and at the same time most romantic, side of war was brought home to Americans.

"Shot as a spy!" The phrase thrills veteran and schoolboy alike and heats the blood of anyone who has a spark of imagination or the spirit of adventure in his veins. In all the English language, there is hardly a word that carries with it such a connotation of contempt as "spy." On the other hand, whether in the preparation for war, or in war itself, there is no more patriotic or self-sacrificing work, nor scarcely any of more profound value to the country which is being served, than that performed by the much-despised, little-appreciated spy.

The rules of war relating to spies are clearly defined and offer no redress, regardless of sex, age, or nationality, to one coming under that classification. If a person, whether man or child, operates secretly within the territory occupied by an enemy during the time of war, for the purpose of communicating information to a hostile army, he is subject to the death penalty. The single provision made in his behalf is that he must be given a fair trial. Yet even this is not assured, for if he be court-martialed and shot, and later shown to have been innocent of the charges against him, there is no redress against his executioners.

Even in the time of peace, the lot of a spy is a hard one if he is captured. In all great countries there are severe penalties for those who work clandestinely to obtain military or naval information for another country. In England, the "Official Secrets Act" makes the communication of such information a felony punishable by long terms of imprisonment, while in Germany there is a sim-

ilar law. To photograph or sketch any of the fortifications of the United States is a crime, while President Wilson recently issued an executive order forbidding airmen to fly over the Panama Canal, and the editor of a western magazine was lately brought into the Federal court for trial because he published photographs of the canal taken from an aeroplane. For 20 years, both France and England have feared that they were infested with German spies. In our own country, the stories of Japanese spies have come to be looked upon almost as a joke, and many persons in Great Britain have so regarded the "German spy" scare there. As concrete evidence of the unmistakable operations of the German intelligence department, however, the British government recently announced that the police had investigated 120,000 suspicious aliens, and as a result 342 persons were imprisoned, against some of whom there is claimed to be unquestionable evidence of guilt. Even more startling than this was the discovery early in the war that a German spy was serving in the British navy, communicating all available information about his ship to an uncle in Berlin, who in turn presented it to the intelligence department. This suggested the possibility, when the British battleship "Bulwark" was blown up, apparently from within, that this was the work of a spy.

Of all the systems of espionage ever organized, that of the German war office is unquestionably the farthest-reaching and most efficient. On the heels of the British government's assurance that the German system of espionage had been effectively broken in the United Kingdom, numerous British war vessels were torpedoed, many sentries were shot, dispatches containing accurate information important to the enemy were intercepted merely by

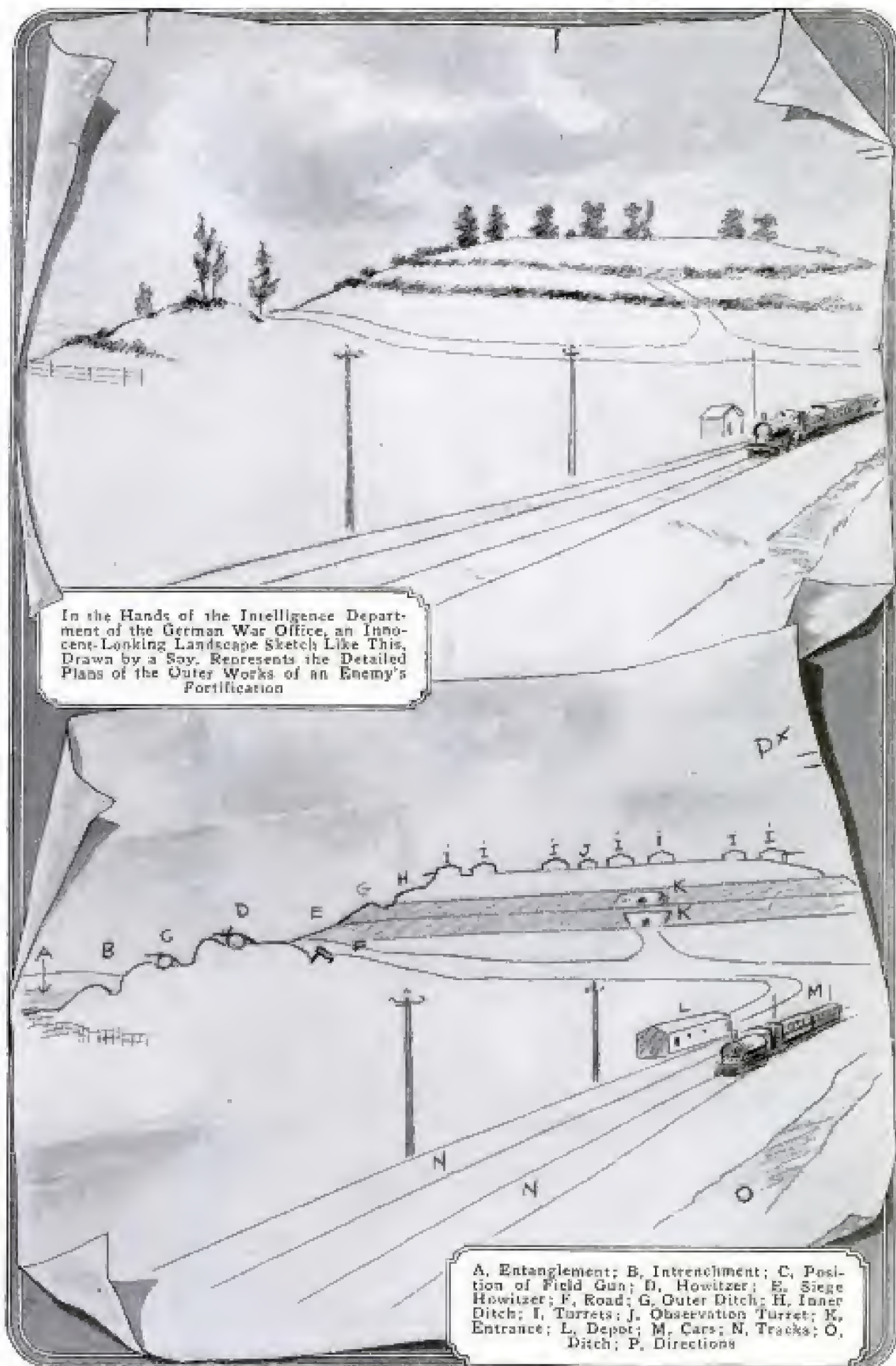
chance, while a German squadron succeeded in stealing past patrol boats, navigating uncharted and mined passages, firing on the Suffolk coast and then escaping. How some of the information which made these things possible leaked out, is known, although the spy has not been apprehended and is still carrying on his work. A secret agent, possibly a dozen of them, stationed on the coast, signaled after nightfall to a "neutral" fishing boat lying a short distance off shore. This was accomplished by means of lights displayed from an upper window of a house a short distance from the water. As soon as the cryptic message was received, the boat—which was unrestricted—put off toward the Dutch coast. But down in the hold of this vessel, protected so as to escape detection in case the craft were searched, was a pigeon loft. A few hours from the time a pigeon was liberated, the chief of the German intelligence department had a translation of his spy's advices before him. This system continued uninterruptedly for days until finally some of the vessels, with their pigeon lofts, were searched by British patrols, and the North Sea was subsequently closed to traffic. But the spies were not captured, nor their communications stopped.

The Rev. Lord William Cecil recites the story of how a British raid on a German squadron in the North Sea was frustrated. During a heated argument in an alehouse, an English sailor, championing the prowess of his navy, declared that he knew positively that dreadnaughts, cruisers, and torpedo boats were at that moment pushing ahead under full steam to surprise the German boats. Shortly afterward the bar was closed for the night, and one of the group, who had precipitated the argument, mounted a bicycle, which had a brilliant headlight, and struck down a road leading along the coast. After a time he jumped from the cycle, released the air from the front tire and then set about to mend a "puncture." In doing this he repeatedly passed in front of the lamp, crossing the patch

of light now for just an instant, now deliberately stopping in front of it. Presently he inflated the tire and pedaled back to the city. When the British battleships arrived at the scene of the intended raid, the Germans were not there. The bicyclist was a German spy. His message, flashed in dots and dashes, had been seen through the periscope of a waiting German submarine.

Yet, flashing code signals to a waiting boat is not nearly so hazardous an occupation as that of the aerial spy who uses the enemy's territory as a base of operation. This method of espionage is distinctly new, and apparently it is as effective as it is unique. As evidence of this, a notice has been posted extensively throughout Scotland, offering a reward of \$500 for information leading to the discovery of secret aeroplane bases which, it is believed, are located in unfrequented parts of Scotland, where supplies of oil, gasoline, and mechanical parts are stored by the enemy. The frequent appearance of unknown aeroplanes over North Britain has given rise to this belief.

The spy does not always work as openly as this. His operations are usually carried on so subtly that he might easily escape detection so long as no untoward circumstance points suspicion directly to him. There are few who would have a keen enough perception to catch the significance of an impressionistic charcoal drawing of a picturesque landscape. And it is for this very reason that German spies were successful, at least in the early part of the war, in making sketches according to a pictorial code which apparently bore no more relation to things military than the ordinary wash drawings or pencil sketches one sees daily in the art shops. In the hands of the German war office, however, these innocent-looking pastoral scenes are not studied for their artistic values. The gently sloping knoll represents a fortification; the quaint rail fence, a barbed-wire entanglement; the bushes on a crest of the hillock, armored gun turrets, and the trees, outer gun positions.



In this way the spy, who for the time being is an "art student" sketching from nature and entirely ignorant that he is near an important fortification, provides his government with a detailed map of the fortress in question.

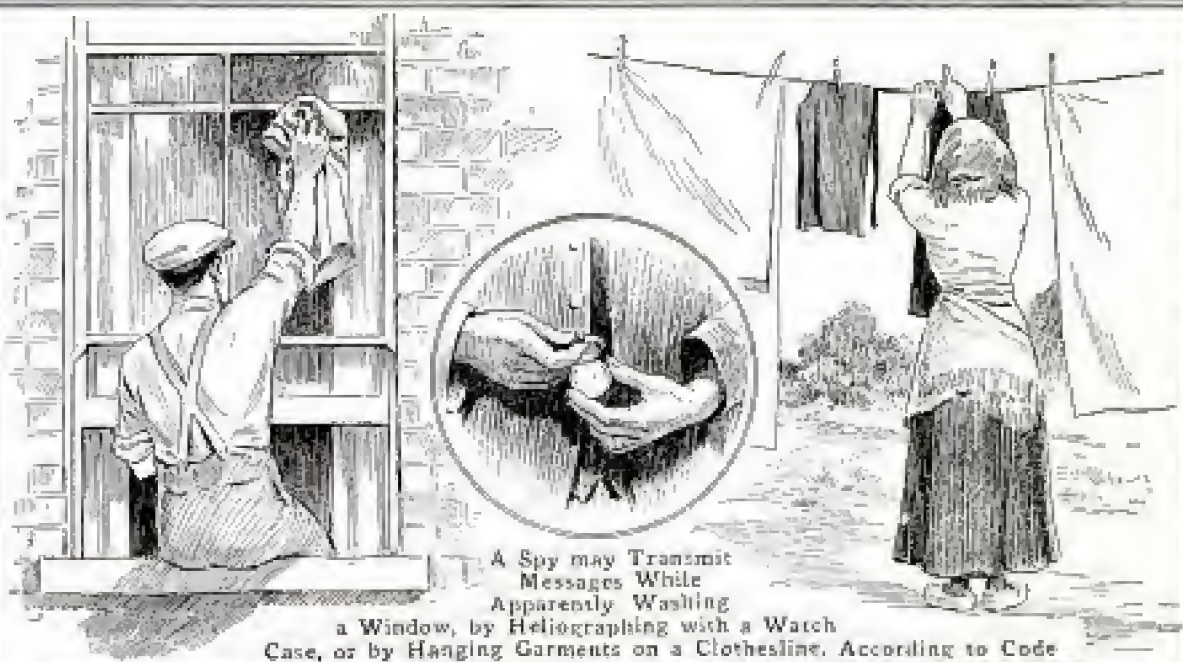
A similar system which is being used extensively by the Germans, and evidence of which is to be found through Belgium and over the frontier of France, is carried out by crudely drawn pictures of cows scrawled on gates, fences, and buildings. These drawings have been encountered by the allies on numerous occasions. They are sketched according to a code, different postures conveying different facts to the German forces. Just what the code actually is, is not known, but how it works is evident. A cow with its tail in the air means one thing, with its horns curved down, another—every different posture has a different significance. Like this was the sign posted over the frontier of France ostensibly advertising a German brand of desiccated soup, but in reality pointing out fortifications, mined ground, food stores, and similar things, for the enemy.

There are many other ways by which an agent, working ahead of his army, may and does communicate information to it without passing back through the lines. Some of these systems are employed to inform the artillery, for instance, where its shells are falling, thus enabling it to get the proper range on the enemy's positions. Some of the subterfuges are so ingenious and executed so cleverly, that detection, because of the act itself, is difficult. For instance, clothes must be washed in war time as well as in days of peace—yet, a clothesline may be made to talk by arranging garments on it by size and color according to a prearranged code. Likewise, the vanes of large windmills, so frequently seen on the Continent, transmit messages merely by turning them to certain positions, a method often used in time of peace to convey information to surrounding neighbors. Such a simple operation as that of washing a window may result in the ultimate defeat of an army. It is readi-

ly seen how a spy thus engaged can signal to a lookout, by means of dots and dashes, for long periods of time, if need be. And the polished interior of a watchcase, a bright spade, a saw, and similar things, all have been used for flashing heliograph messages.

A spy may be anywhere, and often it is almost impossible to tell friend from foe. In the first part of the war, for instance, France was startled to find that several officers and a number of privates in its army were secret agents of the kaiser. During one of the heavy battles along the frontier, a British convoy, hurrying to the front with ammunition, was stopped and told that a detachment of 500 uhlans was along the road ahead. The warning was given by the driver of an English motor car who wore the uniform of a British officer. "Take the road to the left, and after 10 miles bear to the right," he shouted in haste, and then dashed away in the direction he had indicated. Hardly had his words been spoken when 14 British veterans were on their way to rout the uhlans, who, however, were not to be found. A little farther on, the man in the motor car encountered a detachment of British soldiers and was forced to stop. Although his car was English, and he spoke English like a Britisher, he was wearing cavalry breeches with an infantry officer's tunic. He was a German spy. He was shot on the spot. The uhlans were down the left road, whither he had directed the convoy.

Here is a dispatch sent out from the Canadian capital a few weeks ago: "A secret store of arms and ammunition is being searched for on the Isle of Orleans in the St. Lawrence River, just off Quebec. A concrete base upon which a siege gun could be mounted already has been found here. A German, two years ago, bought a tract of land on the Isle of Orleans and established there a plant for the manufacture of concrete blocks. It is upon this property that the concrete foundation has been found. It commands the defenses of Quebec and of the St. Lawrence channel."



Actual Photograph of the Execution of a German Secret Agent by a British Firing Squad

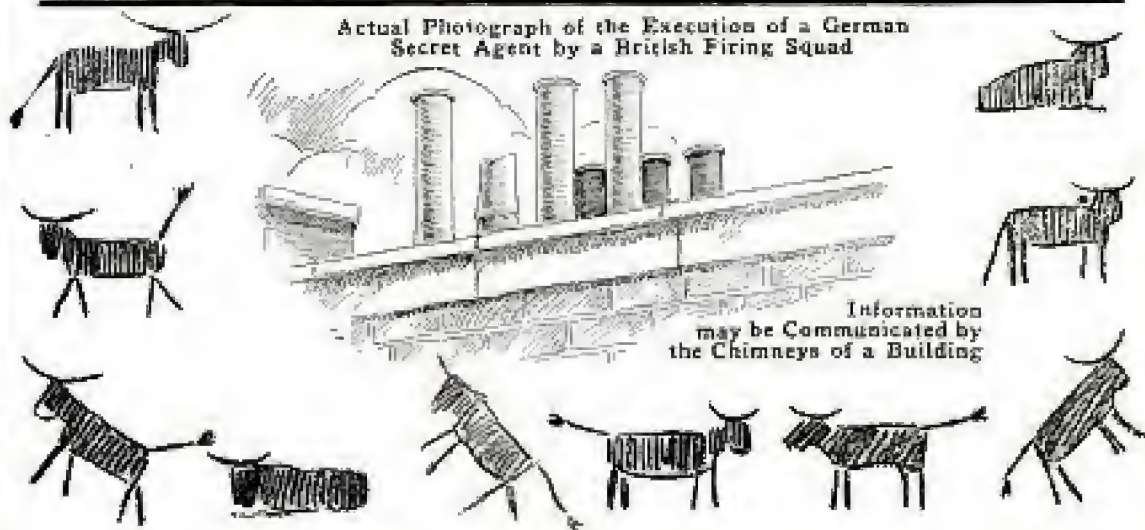


PHOTO COURTESY ILLUSTRATED LONDON NEWS

Each Different Attitude in Which a Cow is Pictured Carries Pertinent Information to German Army

The Liège forts fell before the 42-centimeter guns of the Germans. It is interesting to note, in the reports of correspondents, the accuracy with which the shells from these big German guns were fired. Especially is it interesting when it is remembered that Germany had detailed plans of the Liège fortifications, for German skill helped to build them; and that the massive concrete foundation on which one of these guns was mounted was the site of a German "factory." The range had been predetermined. Therefore, no shells were wasted, nor any time lost in finding the range. It was after this disclosure that the British government discovered that a German "chocolate factory" occupied a position commanding the new naval base at Rosyth, Scotland, while the French government found several "factories" on its own frontier, which covered concrete foundations prepared for the heavy German siege guns.

In America, a spy might operate in comparative freedom, but not so in Europe, where the police system is much different from ours. Because of conditions there, his work must be done delicately. The mere fact that his daily routine is different from that of the people surrounding him, may be sufficient to attach suspicion to him. And all Europe is "spy mad." Therefore, what he says, whom he writes to, and where his letters come from, are all matters which may contribute at any moment to his arrest. His mail possibly is inclosed in an envelope bearing the return address of a German hardware concern and directed to his accomplice, a dealer in London who is in the pay of a foreign government. He may be at Liverpool posing as a physician, and his mail forwarded to him from London in an envelope bearing the address of an English chemical house. Suppose he misses this letter and it is returned to the English factory. Suppose it reads: "Must cancel. Johnson very ill. Lost four days. Shall leave shortly.—Chas. Inglis." There is little of a suspicious nature about its text, yet a dispatch in these very words

was one of the strongest pieces of evidence—a code message to the German authorities—which helped to convict Carl Hans Lody, the German naval lieutenant who was executed at the Tower of London.

This is how a spy works. It is how Lody worked, and how he failed. Incidentally he traveled under the guise of an American citizen, spoke English fluently, was thoroughly familiar with the United States, and even carried an American passport—stolen from a Chicagoan, who had left it at the German foreign office to have it approved. He operated under the name of this man. He visited Forth Bridge, Liverpool, Dublin, and other places. He gained important information concerning the movements of the British navy, noticed that the Houses of Parliament and the Bank of England were protected from Zeppelin bombs by strong wire nets, obtained details of the armament of certain British ships—all of which was admitted in court to be correct—and then communicated the facts to the German admiralty.

Lody, like every secret agent, was a fatalist. He played his game for big stakes against heavy odds, and lost. He was shot at the Tower of London within the shadow of the same buildings where Anne Boleyn, Lady Jane Grey, Thomas More, Sir Walter Raleigh, and others famous in the pages of history, were beheaded. His execution is the first that has occurred within the precincts of the ancient fortress on the Thames since 1747, when Lord Lovat was decapitated, as the most effective means of terminating his claim to the British throne. As a spy—said to be one of the ablest ever trusted by the German intelligence department—Lody died behind the blackened walls of an institution in which more stirring scenes in the political and religious history of the English-speaking people have been enacted, than any other spot in England. But though performing the greatest possible service for his country, he was without assistance from it, unknown, and repudiated by it—a spy.



THE Tower of London, Where Carl Hans Lody, a Secret Agent of the German War Office, was Recently Shot. This Execution Is the First That has Occurred within the Walls of the Ancient Fortress Since 1747. From the Days of William the Conqueror, the Builder of the Fortification, Which was Designed to Defend the Maritime Approach to the City, Down Almost to the Present Time, This has been the Stage Where Probably More Stirring Events in English History have been Enacted Than in Any Other Spot in Great Britain. The Institution has Served as a Royal Palace, State Prison, Place of Execution, Government Mint, Depository for the Crown Jewels, and Armory

Frank C. Perkins
Eric Co. Savings Bank
Bldg 232 Buffalo, N.Y.

2. W. Shaver
411 Jennifer Bldg,
Wash. D. C.

MOTOR SUPPLIES FRESH AIR FOR TELEPHONE BOOTHS

Through the employment of a ventilating apparatus, adequate air circulation has been supplied the telephone

NEW PAPER-MONEY DESIGNS ARTISTIC AND HISTORICAL

The \$250,000,000 issue of Federal-reserve bank notes, which includes \$5, \$10, \$20, \$50, and \$100 notes, is in some ways the most interesting issue ever put out by the government. Each denomination is designed not only to furnish the greatest possible protection against counterfeiting, but to be of artistic and historical value as well. The \$5 note carries a portrait of Lincoln; the \$10 note, a portrait of Jackson; the \$20 note, a portrait of Cleveland; the \$50 note, a portrait of Grant, and the \$100 note, a portrait of Franklin; and it is planned to have these portraits appear on the same notes in all future Federal-reserve issues. The back of the \$5 note carries pictures representing the discovery of America, and the landing of the Pilgrims, while the \$10 note carries typical scenes of agriculture and manufacture. A symbolical picture representing the United States presiding over the Panama Canal occupies the entire back of the \$50 note. On the back of the \$100 note is a picture with a symbolical figure representing America at the center flanked by figures representing Peace, Plenty, Labor, and Mercury, the latter being intended to suggest the distribution of the harvest.



A Complete Change of Air in These Telephone Booths is Made Each Minute

booths in one of the Boston substations. The arrangement consists of a motor-propelled fan which drives currents of fresh air through a duct extending over the top of a line of booths. The air is delivered into each of these through deflectors in such a manner that the occupant is not exposed to draft while using a telephone. As is customary, the doors to the booths are double. Because of this it was possible to arrange openings at the bottom of the inside door and at the top of the outer one, thus providing an exit for the air in such a manner as to eliminate the transmission of sound from the closet to the outside room.

APPLE CIDER CONCENTRATED BY NEW PROCESS

A new process of preserving apple cider produces a condensed liquid that will keep better than raw cider and is easily transformed into sweet cider by the addition of water. The cider is first frozen solid. The ice is then crushed and put into a centrifugal machine such as is used in making cane sugar. The concentrated juice is thrown off by the centrifugal action, while the water remains in the machine as ice. At ordinary refrigerator temperatures this cider will keep for a month or six weeks, and at low temperatures in cold storage it will keep for an indefinite period.

Weekly News Letter

HARDWARE COSTUMES SHOW FASHIONS

During a fashion-show week in San Francisco, a hardware merchant took advantage of the opportunity for a novel window display by exhibiting, on wax figures, millinery and feminine apparel made from various articles selected at random from his store. The popular styles in costumes and hats were carefully imitated by an ingenious arrangement of fiber and metal doormats, wire screening, tin pans, hinges, knobs, brushes, garden hose, and other commodities. The setting represented that of a millinery shop, showing a customer engaged with a saleswoman. About them was a large supply of odd creations in head-gear, all of which were made from wastebaskets, mousetraps, cuspidors, molds, and other devices, and trimmed with screening, dusters, and tubing.



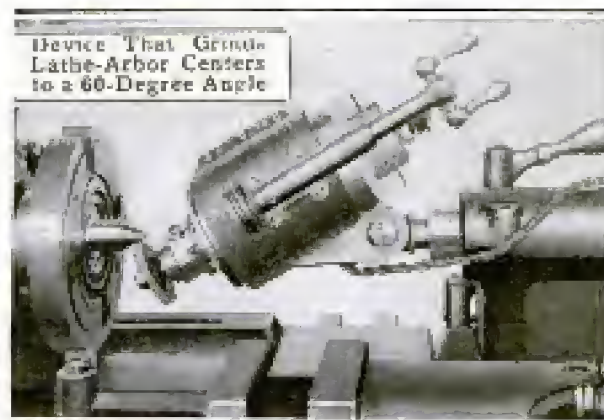
This Window Display Appeared in a Hardware Store during Fashion-Show Week at San Francisco

One of the figures was dressed in a coat made of cocoa-fiber mats and a skirt formed of metal doormats over a copper underskirt.

8375 AUTOMATIC GRINDER FOR LATHE-ARBOR CENTERS

A center grinder that is designed to produce an accurate 60° center on a lathe arbor and to do this without the tedious adjustment and trial grinding usually necessary, has been placed on the market. This grinder is equipped with a taper shank which is inserted in the tailstock of the lathe in place of its regular center, and the feature of the tool is that the spindle on which the grinding disk is carried is set at a 30° angle with this shank, so that the center is ground at a 60° angle without further adjustment. In the body of this

device is a small electric motor which furnishes the power for grinding. The feed is regulated by a cross arm carried on the top of the grinder.



The Kent & Smith Electric Steel Co.,
Cincinnati, Ohio.

MOTORING ROBE PROTECTS

8785 m **ENTIRE BODY**

One of the newest of motoring accessories is a robe that is a combination of foot protector, lap robe, and chest

FOREST-SERVICE STANDARDS

8792 m **FOR HICKORY HANDLES**

Definite standards for ax, sledge, adz, pick, and other hickory handles have been established by specifications prepared by the United States Forest Service. The Panama Canal authorities have already purchased large quantities of handles made according to these specifications, at one-fourth less than the price formerly paid. The specifications have also been adopted as standard by the war and navy departments, and have been approved by the trade. The new rules are a result of a long study of the subject, covering exhaustive strength tests, investigations of the growth of hickory, processes of manufacture, and market conditions. Handles are selected according to weight as influenced by the density of the wood. Heartwood, known as red hickory and formerly discrim-



With the Chest Protector in Place and the Feet in the Pockets, the Entire Body is Protected

protector. This robe is made for two or three passengers, as desired. At the bottom are roomy pockets, one for each passenger, which protect the feet from the wind, while attached to the top of the lap-robe section is the chest protector, which is held in place by adjustable straps fastened around the neck. With the chest protector fastened in place and the feet in the pockets, it is impossible for the robe to slip out of position. The greater part of the weight is carried in the lap, so that no appreciable strain is felt on the neck. One of the advantages of the robe is that it does away with the usual necessity for carrying extra wraps.

nated against in commercial grading, is accepted, since it has been found that weight for weight it is as serviceable as white hickory. Handles which contain small sound knots, or bird pecks so located as not to affect the strength, are also accepted.

NEW EXPLOSIVE IS SAFE

8775 m **AND POWERFUL**
SABULITE

A new explosive that is 30 per cent more powerful than 45-per-cent dynamite, and is said to be as safe to handle as so much sawdust, is being introduced in the mines of Montana. According to reports, this explosive possesses qualities that make it par-

*mining & Engineering
World - Oct. 18, 1914*

Invention of a Belgian

Managing Asst. Asst.
Royal Financial Corp.
Vancouver, B.C.

Substanty Dept.
H. W. Johns. Manville Co.
813 Superior Ave. N.W.
Cleveland, Ohio

Europe:
Willley Mining Machy Co. Ltd.

POPULAR MECHANICS

iculary suited to mining work. It
can only be exploded by a detonator
that applies both heat and shock,
neither of these alone being capable of
exploding it. The product of the ex-
plosion is about 60 per cent water
vapor, with a little nitrogen and
oxygen, and minute quantities of car-
bon dioxide, silica, and lime, so that
the miners can resume work in the
thick smoke following a blast without
danger or discomfort. While the exact
composition of this explosive has not
been given out, it is known that the
base consists of ammonium nitrate,
and that the principal ingredient is
calcium silicate.

BURNING MATCHES CAUSE

STUBBORN FIRE

A stubborn fire resulted recently
when matches stored on the top floor
of a wholesale grocery house in
Youngstown, Ohio, became ignited.
Between two and three carloads of



A Stubborn Fire Resulted When Several Carloads of Matches Stored in This Building were Ignited

bon dioxide, silica, and lime, so that
the miners can resume work in the
thick smoke following a blast without
danger or discomfort. While the exact
composition of this explosive has not
been given out, it is known that the
base consists of ammonium nitrate,
and that the principal ingredient is
calcium silicate.

matches were carried in storage on
this floor and they burned fiercely for
over eight hours. The heat was so
intense that it was difficult for the fire
department to get close enough to the
blaze to fight it effectively.

Propellers on many of the European
air craft are made from selected ash.

BEAUTIFUL LAMP PEDESTAL

FOR PANAMA FAIR

The Panama-Pacific International Exposition at San Francisco will be



COPYRIGHT BY PANAMA-PACIFIC INTERNATIONAL EXPOSITION COMPANY

conspicuous by the beauty of its lighting arrangements, of which mention has been made in previous numbers of this magazine, but a new design for a pedestal supporting two large globes is of rare artistic merit. The globes will contain the new nitrogenous lights, the latest incandescent lamp, the filament of which in-

stead of glowing in a partial vacuum, is inclosed in nitrogen gas, giving great brilliancy with small consumption of current, and avoiding the discoloration of the globe, so objectionable in the ordinary tungsten lamp.

TOURING CAR BREAKS SPEED

8762 M RECORD

A new speed record for stock touring cars was set at the Indianapolis motor speedway recently when a touring car, carrying five passengers, went 62.89 miles in 60 minutes in an official test. Before this test it was generally believed that no stock car equipped with a motor of less than 50 hp. could average as good as a mile a minute with four passengers. This car had only 41 hp., and made the run with the top and windshield raised.

Chicago Daily News

Machinery, 10/3/14

BRASS CASTINGS MADE BY

8419 HYDRAULIC PRESSURE

A process for making small brass machine parts, plumbers' brass fittings, and similar products, by hydraulic pressure has been developed in Germany, and it is thought that this method possesses important advantages over the usual method of casting. The high pressure under which the pieces are shaped serves to compress the metal and materially increase its strength, such defects as blowholes are avoided, and the finish of the work is often such that no subsequent machining is required. In addition to these advantages, the process is said to be cheaper than casting where the number of pieces to be made is sufficiently large to warrant the expense of installing the apparatus and making the necessary dies.

BANK BUILDING NO LARGER

8592 THAN A HALLWAY

What is probably the smallest bank building in this country, if not in the world, is located at Raleigh, N. C. The site of the building was originally a hallway. It has a frontage of 7½ ft. and a depth of 25 ft., and in this limited space an important banking business is carried on.

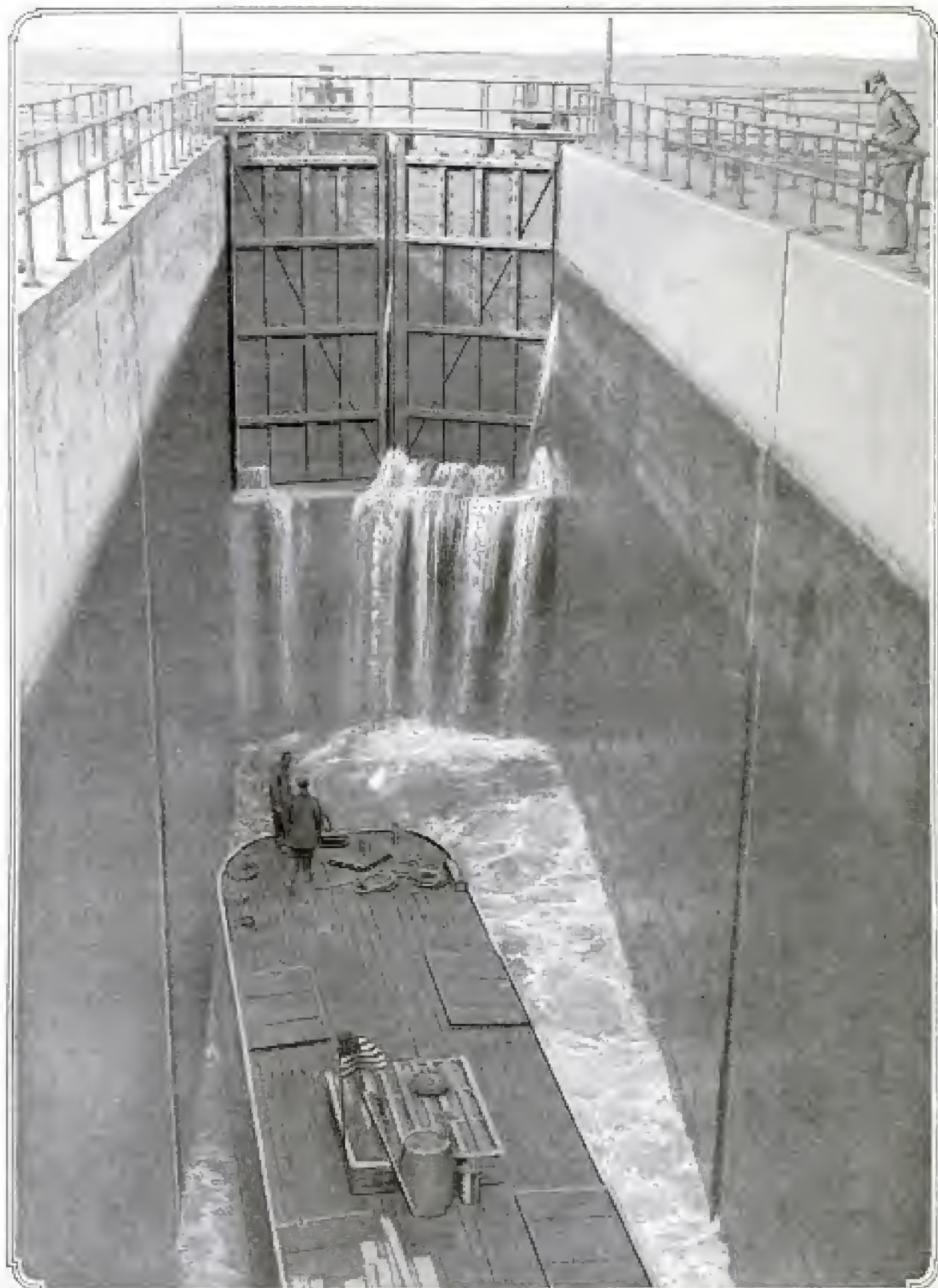


A large percentage of the popcorn grown

in the United States is shipped out of Odebolt, Ia., and North Loup, Neb.

H. E. Zimmerman
Int. Movies, Ills.

SELF-PROPELLED BARGES IN LAKES-TO-GULF TRAFFIC



A DECIDED step was taken in the development of water-borne traffic between the Great Lakes and the Gulf of Mexico when a train of self-propelled barges loaded with 600,000 ft. of Louisiana red gum and oak made the trip from New Orleans up the Mississippi and Illinois rivers to the head of river navigation at La Salle, Ill., and then through the old Illinois and Michigan Canal and the Chicago Drainage Canal to Chicago. These 1,000-ton barges are driven by internal-combustion engines using producer gas which is made on the vessels from waste coke as needed.

Data not given.

**ELECTRIC-LIGHT EQUIPMENT
FOR MOTORCYCLES**

A combination electric-lighting and ignition system, contained in a single unit, has been devised for motorcycles



Powerful Electric Searchlight Provided for Motorcyclists

and is embodied in one of the late models. A magneto generator, comprising the major part of the plant, is housed compactly in a protected place inside of the cradle and back of the engine cylinders. Adjacent to this is a strong storage battery, which serves as an auxiliary unit for both the ignition

and lighting systems and also furnishes current for a horn. The electric equipment is all controlled by an automatic switch. When the motor is stopped, the horn is cut out so that it cannot be meddled with while the machine is unattended, and at the same time the storage battery is connected in so that the lamps remain lighted. The headlight is fitted with two bulbs, one of low candlepower for city service, and a large one for use when a powerful light is needed, the strength of which is indicated by the accompanying photograph. The tail lamp is so mounted that it is quickly detached for inspection use. Practically all the wiring is incased in metal tubing so that there is little danger of a cross circuit from worn insulation, and small chance of accidentally breaking the connections.

**OPERATING AN ALASKAN
RAILWAY IN WINTER**

Keeping the line cleared of snow and ice is the biggest problem in the operation of the railway that runs from Cordova, Alaska, to the Bonanza copper mines. Although snowsheds have been built along the most dangerous places, it is not an uncommon thing for this railway to become blockaded with snow so that trains are stalled for weeks, and on one occasion there were no trains for nearly two months. Rotary snowplows are in almost constant service during the winter, but when the snow drifts to such depths as 40 ft., as it sometimes



Stalled in an Alaskan Snowdrift



Digging Down to the Railroad through 40 Feet of Snow

Rotary Snowplows Like This Are in Almost Constant Use on Alaskan Railroads in Winter for Keeping the Line Open

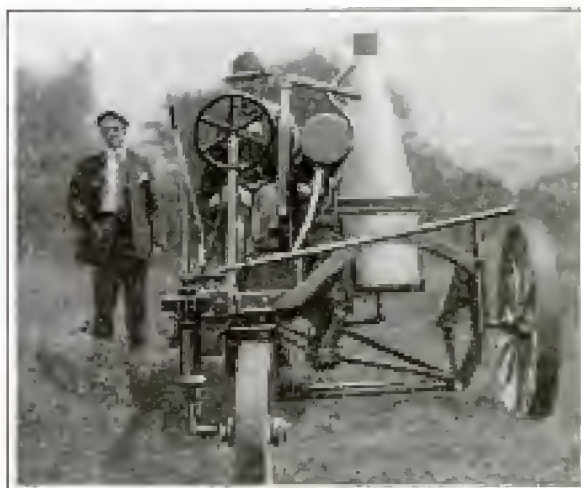
*E. E. Hurja
c/o Post-Intelligencer
Seattle, Wash.*

*Henry Electric Co.
Anderson, Ind.*

Lester A. Bargent
 703 1/2 St. N. W.,
 Wash. D. C.

does, even these powerful machines are unable to keep the line open. On one occasion the fuel was used up and the rotary was caught in a snowdrift. The conductor managed to reach a relief telephone and notify the Cordova office of his plight. Oil and several dog teams were sent out on a relief engine. When this engine was stopped by the snow the oil was loaded on the dog sleds and taken over miles of drifts to the stalled rotary. The railway follows a river bank for much of its length, and during seasons when there is alternate freezing and thawing, the overflow from the river forms over the track a solid sheet of ice that can be removed only by dynamite.

engine clutch to the sickle bar, entirely independent of the traction-power



Gasoline Mowing Machine Which may be Used Also for Plowing or Cultivating

CIGAR LIGHTER HAS CASE

8148 ⁴ LIKE SMALL WATCH

Bearing the appearance of being an ordinary timepiece, a cigar lighter has been invented which is fitted in a case similar to that of a closed-face watch. A pressure of the thumb upon the stem opens the lid, like that of a hunting-case timepiece, while a further depression of the stem ignites the burner. When the stem is pushed down as far as it will go, it pulls a lever which releases the sparking wheel. Because of this arrangement the case may be opened for cleaning or refilling without producing a flame.



transmission shaft. The cutting bar may be removed at will, and a plow, cultivator, drag, or other implement, substituted. The machine is equipped with a 2-cyl., 8-hp. motor.

HOW LUMBER IS PILED IN

8427 ²⁷ ENGLISH YARDS

In English lumber yards it is the custom to keep together all the lumber that has been sawed from one log, so that the purchaser has the advantage of uniformity in his lumber. This custom is followed not only in rough lum-



The English Custom in Piling Lumber Is to Keep Together All the Lumber Sawed from One Log

NEW "STEEL HORSE" BUILT

7731 ¹⁴ FOR FARM WORK

One of the recently developed motor-driven implements intended for agricultural purposes is a three-wheeled mower which is capable of being used for various other purposes on a farm. It has a direct chain drive from the en-

ber, but in that used for cabinetwork, interior trim for buildings, and for other purposes.

The Woodworker
 Sept 1914

Coal-tar creosote and zinc chloride are mainly used as wood preservatives.

Tractor built by: Ward
Tractor Co., Lincoln, Neb.
Engine made by - Graham
Tractor - 14 hp - 14 hp - 14 hp

MOTORCYCLE-MADE INTO

8761 m MOTOR SLEIGH

By an ingenious arrangement of runners a resident of Ontario is able to use his motorcycle with side car with-



Motorcycle with Side Car Equipped with Runners for Operating in Snow

out difficulty during the Canadian winter. In preparing the machine for the winter the rubber tires are taken off the front wheel of the motorcycle and the wheel of the side car, and runners are fitted on and bolted to the rims of these wheels. The rubber tire is left on the rear wheel for driving, and works very well in the rut made in the snow by the runner fixed to the front wheel.

DUST-CATCHING LIQUID FOR

8645 m COAL MINES

A liquid, composed mainly of glue and a 40-per-cent solution of calcium chloride, is coming into use as a means for catching and keeping down the dust in coal mines. The liquid is carried in a tank which can be taken down the shaft in the cage and then mounted on wheels and moved about the workings, as required. It is then sprayed

on the floor, walls and roof with an apparatus that uses compressed air at a pressure of about two atmospheres. The sprayed surfaces look for a short time as if they had been whitewashed, but soon become coated and blackened with the coal dust. Floors treated in this way are slightly springy when walked on, but are not sticky. The liquid is applied about once in three months, and costs about 50 cents per yard a year. In addition to its value as a dust collector, it is said to preserve the rock from erosion and the timber from decay.

ARTISTIC AND SERVICEABLE 8359 CONCRETE WATER TROUGH

Standing in a public square at Redlands, Cal., is a concrete water trough which is both substantial and artistic. It is a type of basin which is serviceable as well as inexpensive, and represents a style of work which is being widely adopted throughout the state. In many of the coast cities concrete is being used in the construction of park benches, street-car waiting stations, drinking fountains, and other utilities. The noticeable effect of this is that in

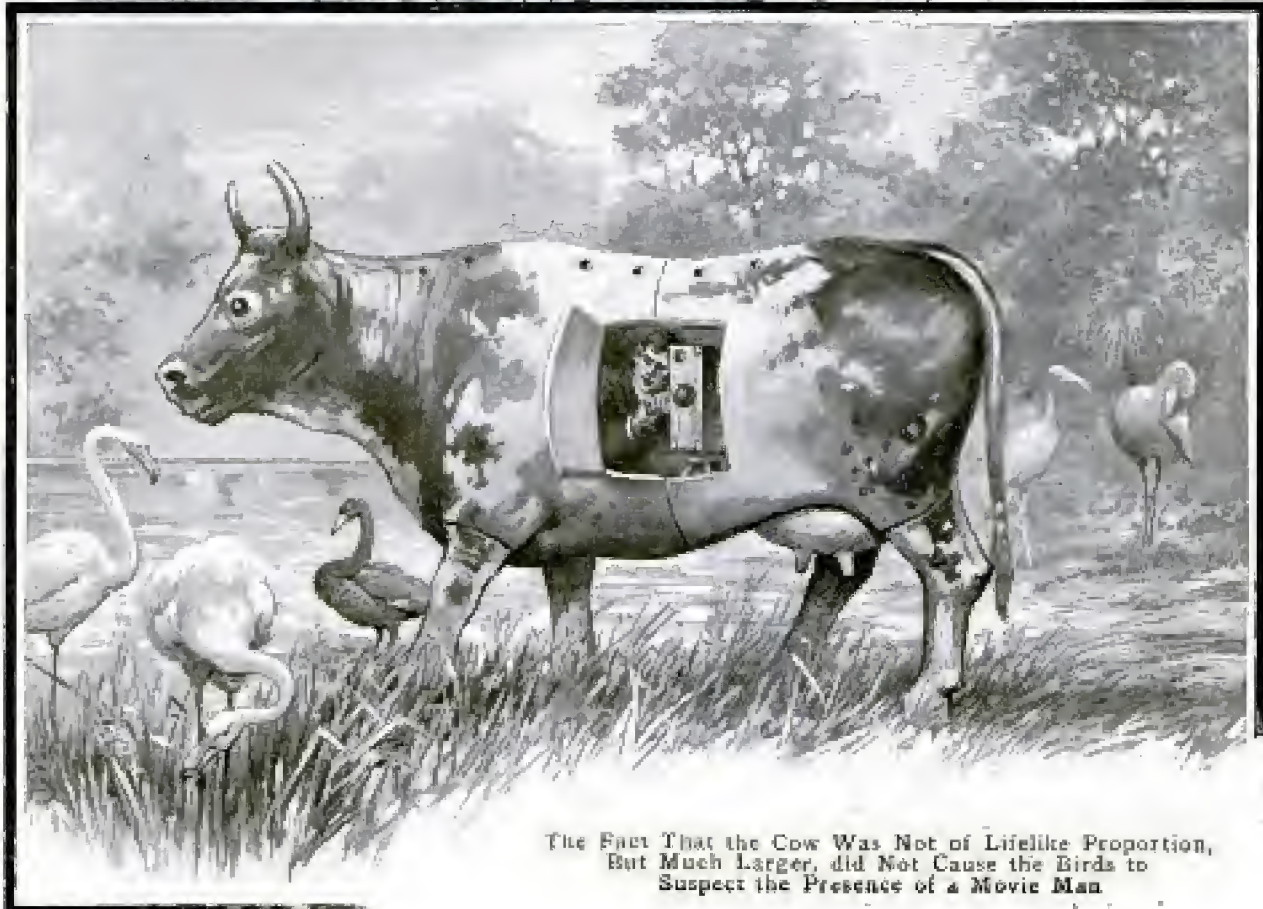


A Rough, Artistic Water Trough Made of Concrete

the majority of cases the device, besides filling the function for which it is intended, adds to the general appearance of the surroundings.

Compressed air magazine
Oct. 1914

H. S. Marshutz Box 966
Stanford University,
Cal.
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The Fact That the Cow Was Not of Lifelike Proportion, But Much Larger, did Not Cause the Birds to Suspect the Presence of a Movie Man.

COURTESY ILLUSTRATED LONDON NEWS

"COW" SECLUDES MOVIE MAN TAKING BIRD PICTURES

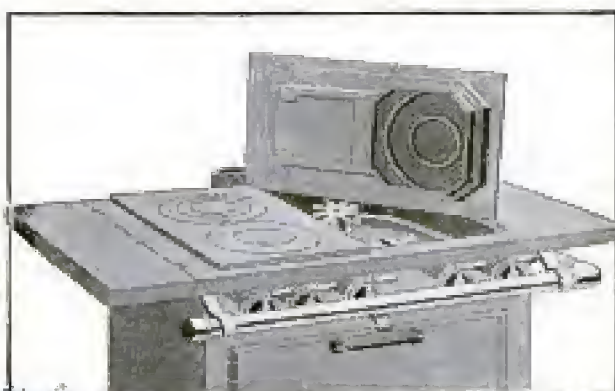
Remarkable studies of tropical bird and animal life were recently made with a motion-picture camera by an operator who was able to lie for hours at a time in artificial blinds within a few feet of rare feathered creatures, leopards, lions, and other animals of the jungle. One of his interesting methods of getting close to the haunts of different birds was the construction of a large cow, which, like the ancient Trojan horse, secreted him and his camera, permitting him to take movies without being discovered or frightening away his subjects. A peculiar thing regarding the cow, and the attitude of birds and certain animals toward it, was that, although it was much larger than life-size, and remained for hours immovable and silent, it did not arouse any suspicion. It was of the form and color of a real cow, and that was sufficient to deceive other animals. Pictures showing intimate glimpses of wild animals springing upon game, playing

with their prey as a cat does, and many other unusual studies were caught by the camera from the interior of rocks made of canvas, and from hiding places in hollow trees.

NEW GAS RANGE SAVES

7744 m FUEL

Making two gas burners do the work of five, with a resulting saving in fuel,



The Front Lid is Heated by the Direct Action of the Flame, and the Hot Gases Pass to the Rear through the Box Flue, Heating the Rear Lid

H. R. Corwin

is the feature of a new gas range that has just been brought out. The top

("Top Box Flue Heat Distributor") Fireman's Insurance Bldg., Newark, N. J.

*From Anne Gordon Whelan
 4248 N. Postman, Chicago
 (contrib.)*

Protherus 5/9/14
**BRIDGE IS STRENGTHENED
 BY NOVEL METHOD**

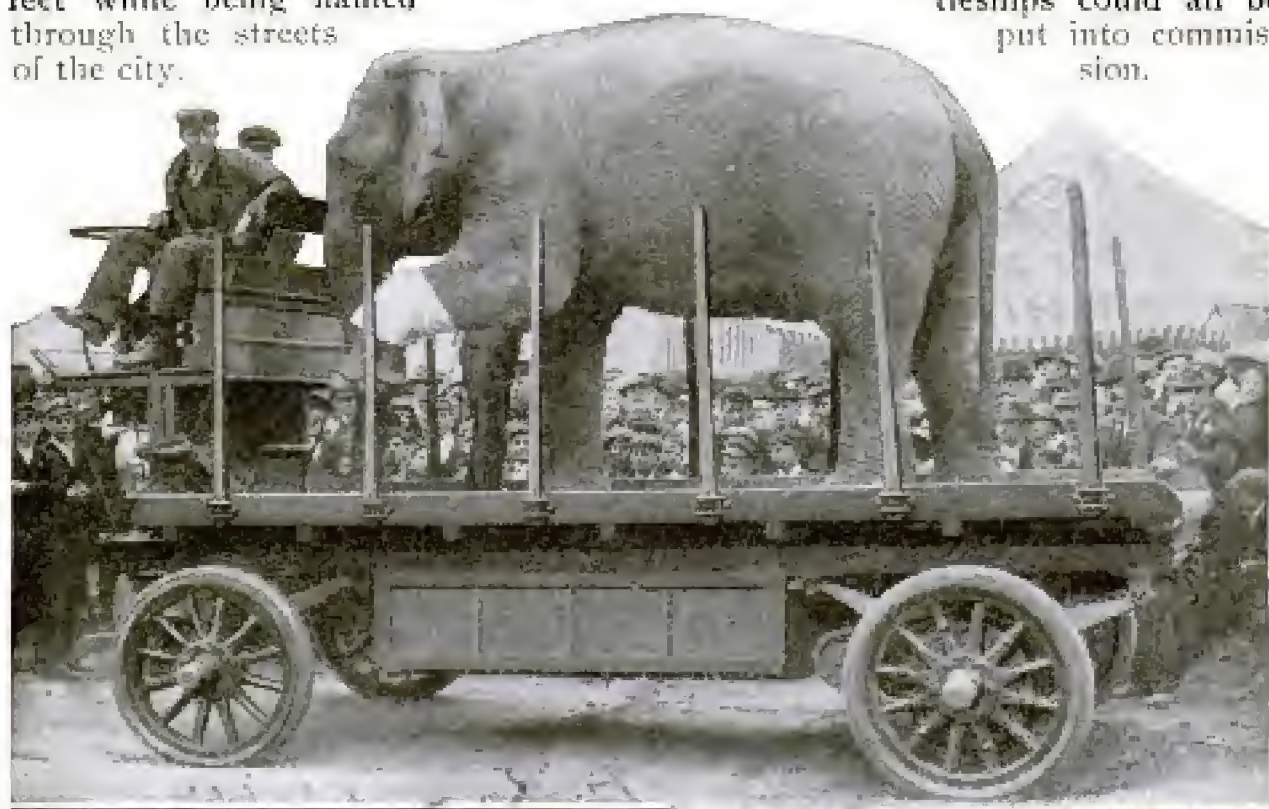
of the range consists of two detachable sections, each heated independently by one burner, and each section has two stove holes, with lids like those of an ordinary stove. Each burner is at the front of the stove and heats the lid over it by the direct action of the flame. The hot gases, instead of escaping as in an ordinary stove, then pass through a shallow flue to an outlet at the rear, heating the remainder of the section.

8x56
**ELEPHANT HAULED ON TRUCK
 THROUGH CITY STREETS**

While a circus was playing at Detroit, an elephant injured one of its legs so seriously that it was nearly impossible for the animal to walk. The problem of carrying the huge beast to the railroad in order that it might accompany the show, was finally solved by employing a motor truck. Considerable scheming was required to get the animal to climb onto the vehicle, but after it had apparently become assured that the truck would not break under its weight, the elephant mounted it and then calmly balanced on three feet while being hauled through the streets of the city.

7881 m
 Using the steel trusses of a railroad span as reinforcing for a new concrete structure built around it was the novel method adopted on a railroad in Sweden for strengthening a bridge that had become too light for the traffic it was required to carry. A reinforced-concrete arch, having a span of about 118 ft., was first erected under the steel span and from this arch concrete columns were erected for supporting the lower chords of the trusses at the panel points. The trusses themselves were then inclosed in concrete so that the entire bridge is in effect a new reinforced-concrete structure. To prevent damage to the setting concrete during the work of construction by vibration from passing trains, the track was raised about 2 ft. and carried on an independent wooden trestle.

¶ In the event of a war it would be necessary, under present conditions, to enlist 18,000 additional seamen in the United States Navy before its 33 battleships could all be put into commission.



Using a Motor Truck to Carry an Injured Elephant from the Show Grounds to the Railroad

H. E. Zimmerman, Int. Morris, Ills.

SCHOOL BUILDINGS PLANNED BY BOY ARCHITECTS

76415m By CHARLTON LAWRENCE EDHOLM



Grammar School in the Old-English, Half-Timbered Style: Not Only Artistic in Design but a Thoroughly Practical Building for School Purposes



Above: North Front of Arts Building Planned by High-School Boys. In This Building Decorative Effect is Sacrificed to Lighting Requirements

Below: Attractive Corner at the Front of a Stairway in the Arts Building: The Decorative Treatment of the Interior is Simple but Effective

All the details of a \$90,000 arts building recently built in Los Angeles were planned by a class of six boys during their final year in the architectural course of the Polytechnic High School in that city. This building forms a part of the high-school group. The general plan was laid out by the head of the architectural department, and then the boys were turned loose on the job to work out the details. How well they did their work is shown by the resulting structure, which stands as a convincing argument in favor of the modern educational method that brings the practical daily work of a trade or profession into the classroom.

The arts building is a structure of reinforced concrete and steel and comprises three stories devoted to classrooms, laboratories, and offices for

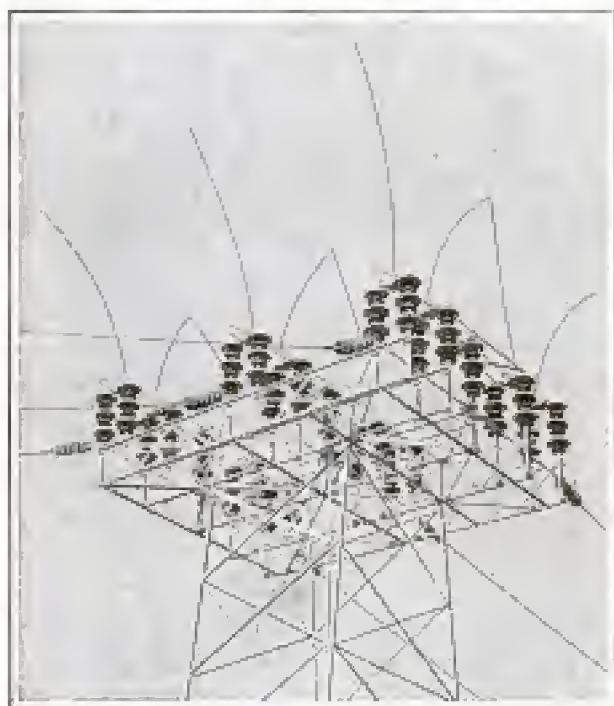
the department heads. Its lines are severely plain, the practical requirements of school construction being the thing that is emphasized. The construction is sound and, above all, there is plenty of light. In spite of the sparing use of decoration the building as a whole has a pleasing appearance. On the ground floor is a mechanical and electrical laboratory, 110 ft. long and 35 ft. wide. The upper stories are made up of 10 large classrooms, 14 small classrooms, and six offices for the instructors, with lavatories and other conveniences.

This is not the first building designed by boys in this Los Angeles institution. Other classes, doing the work as part of their classroom study, have designed two of the best grammar-school buildings in the city, both of which are sound examples of good construction for educational institutions. One of these, the grammar school on Avenue Sixty-Second, has the plastered walls and timbers of the Old-English structure. This building was erected at a cost of \$28,000 and is not only artistic in design, but is a thoroughly practical building for school purposes.

CA hospital train is to be installed on a railway in India built for strategic purposes.

OUTDOOR SUBSTATIONS FOR HIGH-VOLTAGE LINES

54
As a result of an extensive series of experiments a full line of electric switches, circuit breakers and lightning



Outdoor Electric Substation That Operates under a Pressure of 150,000 Volts

arresters for outdoor use in any climate, and designed for operating without the protection of any kind of housing, has been developed. An installation of this kind that operates under a pressure of 150,000 volts is shown in the illustration. In

this apparatus all bearings are constructed either of bronze or of special babbitt, and are immune from freezing or rusting. One of the interesting features about this installation is the circuit breaker, which works in such a way that the current is materially cut down before the final break occurs, and thus greatly reduces the surging in the electric current which takes place when the current is suddenly shut off, and which corresponds to the water hammer in a water pipe when a valve is suddenly closed.

REVERSED BOOTS A FEATURE OF MILITARY FUNERALS

8721
An old custom almost universally observed at the funerals of commanding military officers is that of leading behind the coffin the dead officer's riderless horse, fully equipped with bridle and saddle and carrying the officer's boots turned backward in the stirrups. This custom is illustrated in the photograph of the funeral of Sir Charles Douglas, a British general killed in action in the European war.



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The Funeral of Sir Charles Douglas in London: Carrying the Dead Officer's Boots Turned Backward in the Stirrups on His Riderless Horse Is an Almost Universal Custom at the Funerals of Commanding Officers



Small Frame Dwelling Struck and Pushed 40 Feet from Its Foundations by a Train of Cars That were being Switched in an Industrial District in Chicago

8687m **DWELLING CRUSHED BY
RAILROAD CARS**

Through some mistake in throwing a switch, or loss of control by the engineer in handling a string of 40 cars that were being switched in an industrial district in Chicago, a frame dwelling was wrecked and pushed over 40 ft. from its foundations; and of the family of five sleeping in the building, one, a child of four, was killed, and the remainder were injured. The train was being backed by two locomotives.

8625m **REMARKABLE CLUSTER OF
GRAPEFRUIT**

A cluster of grapefruit weighing $18\frac{1}{4}$ lb. and consisting of 18 units of the fruit on one stem, has been produced in an orchard in Alabama. This remarkable cluster was picked from a tree that was three years old, and was a part of the first bearing.



8765m **RUBBER MAY BE MADE FROM
COKE-OVEN GAS**

Recent experiments indicate the possibility of making artificial rubber from coke-oven gases. These gases are known to contain hydrocarbons of various kinds, and efforts are now being made to separate from the gases the particular hydrocarbons found in natural rubber.

Scientific American

Can official proclamation in Germany prohibits the sale of motor-car tires to private individuals, as all available tires are needed for military purposes.

*J. Harry Hughes
161 S. Warren St.,
Mobile, Ala.
Shown by W. E. Sweet
in photo Ala*

Amer. Machinist 7/10/14

Union Caliper Co.,

246 Orange,
Mass

POPULAR MECHANICS

HANDY ATTACHMENT FOR CALIPERS

8434

A new attachment for calipers makes it possible to transfer measurements in cases where the calipers cannot be removed from the



object being measured without spreading the points. This consists of a notched bar that can be easily attached or removed. The manner of using the instrument is shown in the illustration, where the thickness between recesses in a casting is being

measured. The instrument is set in the usual way and the notched bar adjusted accordingly. The bar is then raised off the pin, the calipers removed, and the bar replaced in the same notch.

of those made of cast iron. The principal advantages in steel-cylinder motors are their light weight in comparison with cast iron, the possibility of better cooling due to thinner metal, increased efficiency because higher compression is possible with better cooling, and greater accuracy in manufacture.

ALL FURNITURE OF BEDROOM IN ONE ARTICLE

8561

A bed that combines in one article all the necessary furniture of a sleeping room and which makes a comfortable and attractive-looking couch by day has been patented by a Texas man. Closed up it resembles an ordinary bed with the exception of nine drawers and two cupboards. There is a place for slippers and shoes, another for cuffs, collars, and neckwear, another for underclothing; there are places for silverware, dishes, cooking utensils; a coat hanger and wardrobe for other wearing apparel at the foot of the bed, also a smaller opening just above for magazines and books. A box contains places for clothing, hats, and gloves.

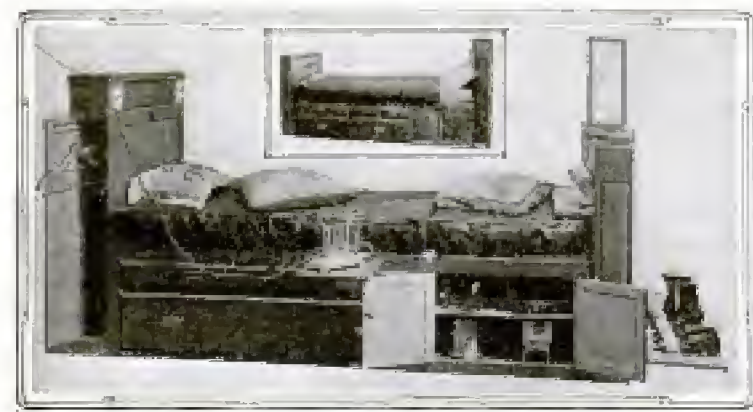
There is a clock in the footboard with an electric light operated by a push button. The bed is also equipped with an electric cooking attachment; a looking glass is under the top panel of the headboard, which is removable. The bed covers are held in position by a patent clamp. The base, head, and foot sections interlock and the whole thing can be taken apart and closed up in box form.

STEEL-CYLINDER MOTORS

8773

MADE AT LOW COST

Steel-cylinder motors, while in fairly common use for air craft, have not been adopted to any great extent for automobiles, largely on account of their high cost. A German firm has now succeeded in making such motors at a cost only slightly greater than the cost



This Novel Bed Contains All the Furniture Required in the Sleeping Room

Lola A. Binchon
Seymour, Ind.

Manufacturers of Bird Houses:
1 - J. H. Dodson, 105 E. La Salle, Chicago
The Crescent Co., Long River, N.J.

INSECT RAVAGES COST \$500,000,000 EVERY YEAR 8750 H IN DAMAGE TO CROPS

How can this tremendous economic waste be checked?

The Federal Government says: "Protect our native song birds."

THE movement for the protection of American song birds, first stimulated through sentiment, has developed into a nation-wide economic propaganda, backed by the Federal government.

Scientific investigation is responsible for the assertion that were it not for birds, insects would render the entire American continent uninhabitable within a few years. As it is, the annual damage done to trees and growing crops by the ravages of insects represents a loss which has been estimated at more than \$500,000,000, and this mainly because the normal balance between bird life and insect life has been upset by the destruction of song birds. Nearly 90 per cent of the birds of this country, it is estimated, have been exterminated through the various influences of commercialism, sport, ignorance, and cats. Since the preservation of the remainder is necessary from the standpoint of dollars and cents, the government has undertaken to protect the insect-eating birds and assist in their natural increase.

One of the important steps in this direction was the recent bird census, the first enumeration of the kind ever made in this country. It has just been completed, and while the final tabulations are not yet available, estimates indicate that there are, exclusive of sparrows, approximately 2,026,000,000 native birds in the region east of the Mississippi River. The most numerous of these is apparently the robin, of which there are about 100,000,000. Omitting timber land and that planted in crops, there are probably about 1,000 pairs of different kinds of birds to each square mile within the area. Bird life seems to be most prolific in the vicinity of Chevy Chase, Md., where an average of about seven pairs to each acre has been found. Large territories in Arizona and New Mexico, however, are re-

ported not to contain more than one pair to every seven acres.

In spite of their great economic value, song and field birds have always had a hard fight for life in the United States. They have been driven away from many districts, their nests robbed and their young killed by English sparrows. In other sections their nests are destroyed in the spring by the burning over of the fields; millions are killed by poison meant for insects; many are wantonly shot because they are commonly thought to subsist mainly upon grain and fruits, while annually thousands are killed by cats. Certain ornithologists maintain that the average country cat will slaughter as many as 50 insect-destroying birds a year.

An important part of the new movement for bird preservation is the efforts that are being made all over the country to provide nesting places and protection in the breeding season. There are certain principles which must be followed in order to induce birds to nest in a particular spot, but they are simple, and if observed, will often even cause migratory birds to winter in a yard, or on a farm, where they know they will be cared for. The construction of houses, feeding shelters, bathing basins, and similar devices, or even any one of them, if intelligently done, will attract birds. It must be remembered, however, that a bird is just as particular, in many respects, about the place of its abode as is a person, and the requirements of one do not always correspond to those of another. For instance, a bluebird or a wren is content with a tomato can for a nesting place, while this is not true of the chickadee and many other birds. In building houses for birds which ordinarily excavate their nests in tree trunks, the diameter of the entrance and the depth and diameter of the cavity must be made understandingly.

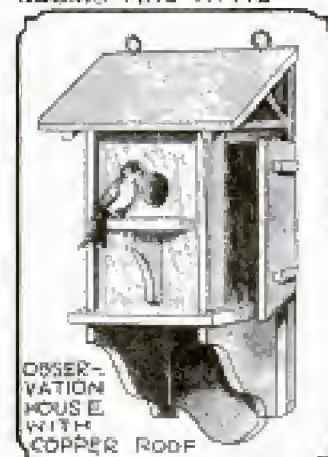
4 - The Maplewood Biological Laboratory, Stanford, Cal.
3 - Charles E. White, Box 45, Kenilworth, N.J.
2 - The Audubon Bird House Co., Meriden, Conn.

Chickadee & Wren, D.O. May 22 1915, Boston, Mass.

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PURPLE -
MARTIN HOUSE WITH 26
ROOMS AND ATTIC



OBSER-
VATION
HOUSE
WITH
COPPER ROOF



A
WREN
HOUSE

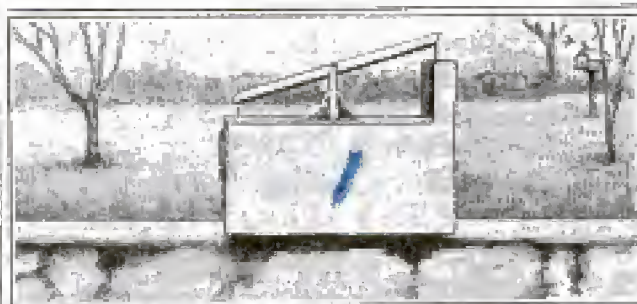


SUET BASKE
ON TREE
TRUNK -
ALSO A
CEMENT
BIRD
BATH

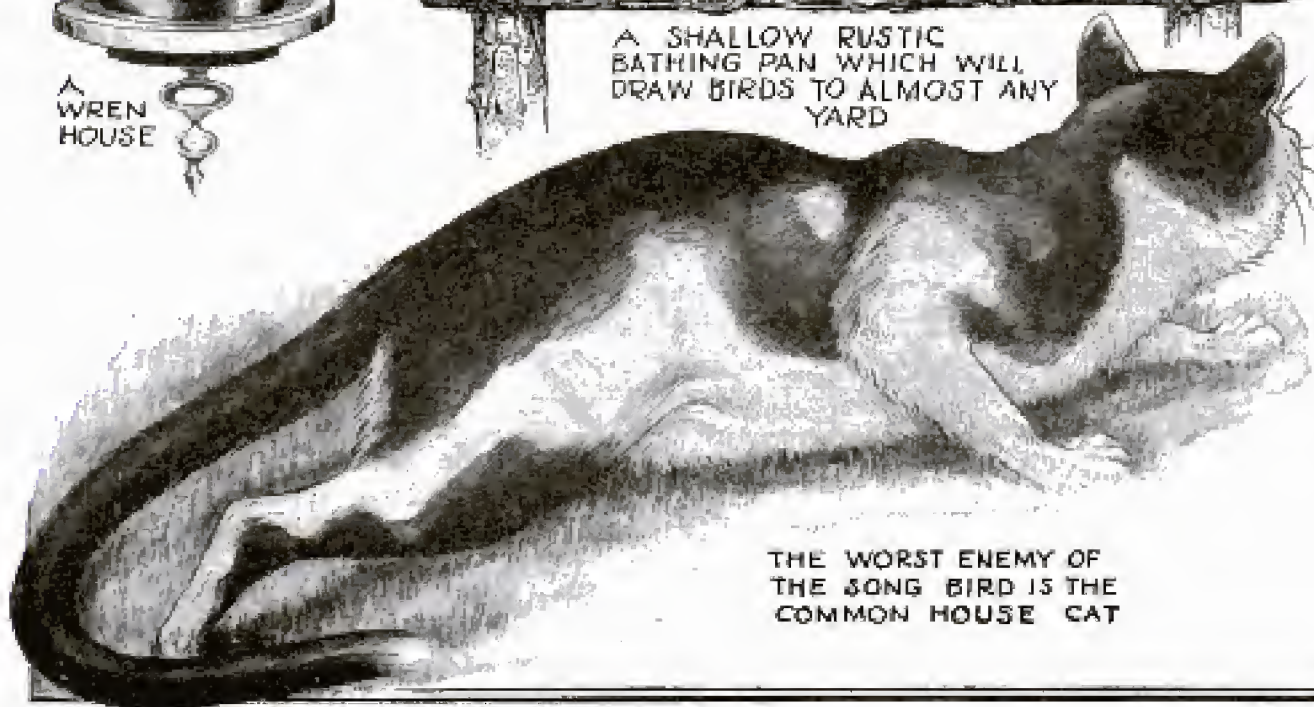


A SHALLOW RUSTIC
BATHING PAN WHICH WILL
DRAW BIRDS TO ALMOST ANY
YARD

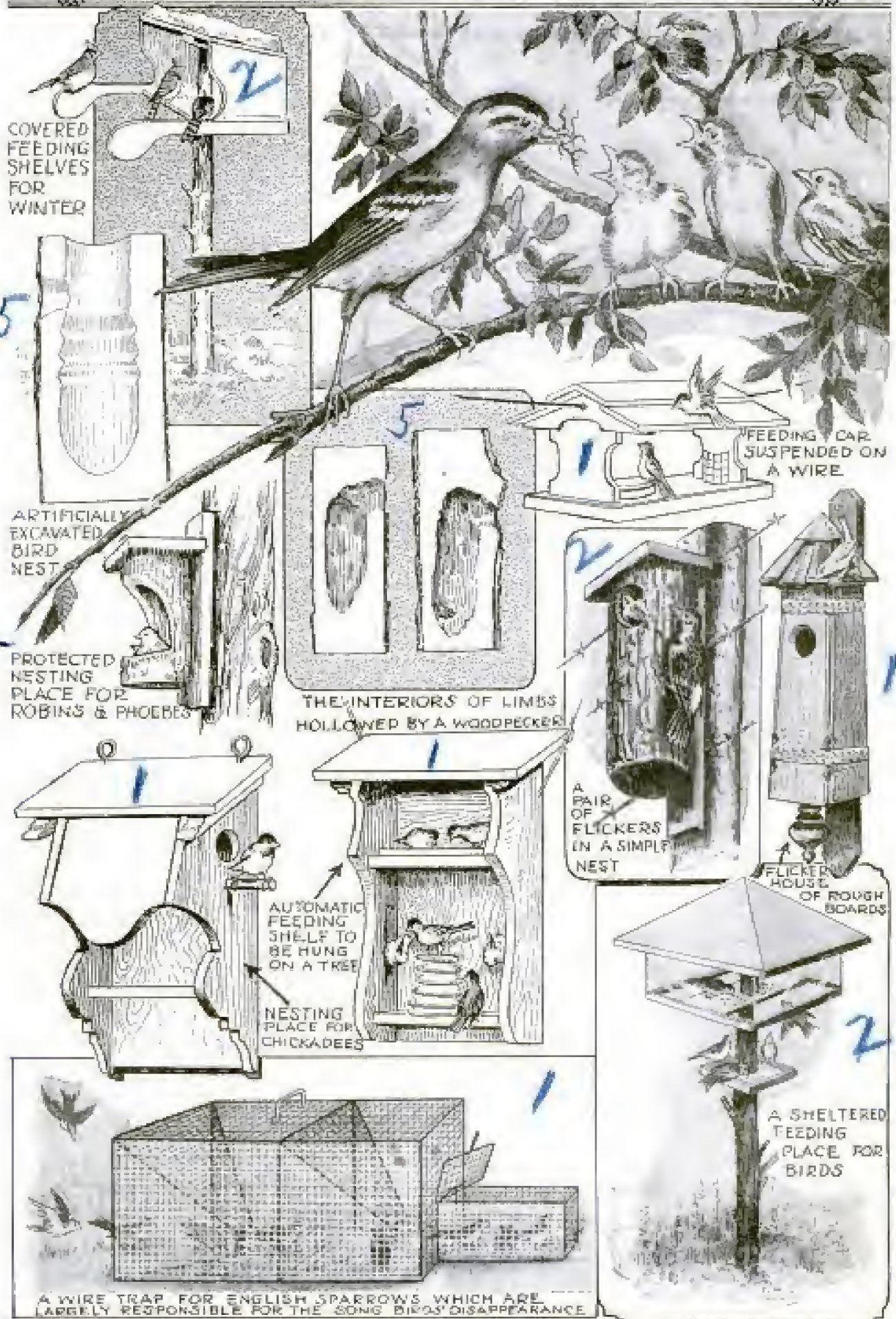
In all cases, the entrance hole should be in proportion to the size of the bird for which it is intended, and should also be countersunk to exclude rain. Ventilation openings for all bird houses must be placed at least as high as the entrance, and preferably higher, while all nails should be covered with putty and joints made tight. A weathered-wood stain or a natural-green paint is suitable for houses placed in trees or thickets, while a gray or white color is good for those which are put on poles in conspicuous places. In



AN EFFICIENT CAT TRAP



THE WORST ENEMY OF
THE SONG BIRD IS THE
COMMON HOUSE CAT



all instances the entrance hole should be placed away from the prevailing direction of the wind during stormy weather.

Scientifically built houses and accessories for the proper care of native birds are now being produced commercially in large numbers. A wren house, shaped like a small cask, is intended to be hung from the limb of a tree. Another house, much like this, but designed to be mounted on a pole, is built for bluebirds. In both cases, the houses are made with four compartments, the reason being that neither a wren nor a bluebird will ordinarily occupy the same nesting place two years in succession, while they are satisfied to take different apartments in the same structure. A single house, made in different sizes, to accommodate wrens, chickadees, tree swallows, bluebirds, flickers, small owls, and woodpeckers, is hollowed from a piece of bark-covered pine. The cavity is shaped much the same as natural nests excavated by woodpeckers and flickers. A nesting place for robins and phoebes is different from most other shelters, and in one form consists of a hollowed limb which is entirely open down the front. Martins rarely live alone, almost always dwelling in colonies. Because of this, their houses are built with connected apartments, ranging in number from 12 to 56, and more. For flickers and golden-winged woodpeckers, a six-sided house, about 26 in. in height, is made.

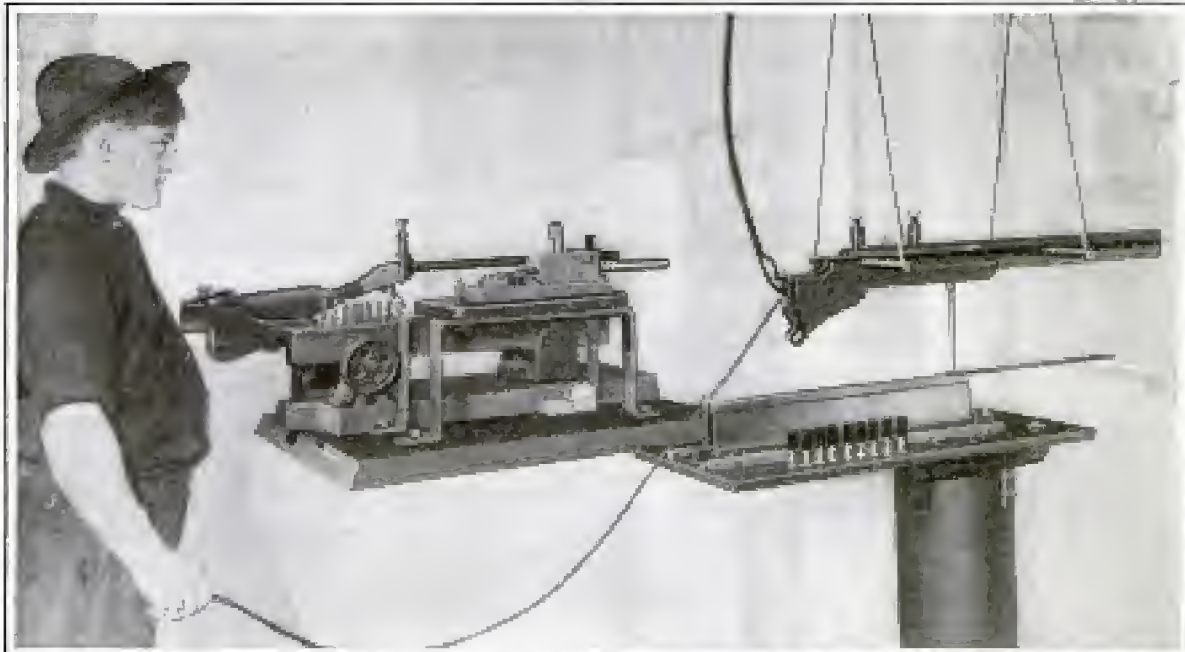
There are many different feeding devices intended to induce birds to remain in the North throughout the winter, several of which are illustrated herewith. Melted suet, in which ground nuts and scraps of meat are mixed, is the standard ration for the winter feeding of song birds. There is hardly any one thing which will attract birds more quickly than a shallow bathing tray filled with water, of which a number of designs are now available. Song birds cannot be gathered in large numbers until the English sparrows are eliminated. Since the individual sparrow has a very limited range of travel, they

may be exterminated from a specific locality without great trouble. To accomplish this a wire trap has been introduced which will do much toward freeing the neighborhood of the pests. Sparrows thus trapped may be killed by drowning, or by other methods if they are to be used as food, as is becoming more and more the custom in some localities, while song birds, if any are caught, may be removed without injury. Another trap is made in the form of a bird house and has an entrance hole just large enough for a sparrow. It has a false bottom which trips and drops the sparrow into a drawer, that has small holes, through which a wren, if caught, may escape. Aside from sparrows, nothing will keep song birds away more certainly than a cat. A trap made expressly for capturing stray cats acts without injuring the animal, so that if it is merely wished to banish it from the neighborhood, it may be sent to an anticruelty society. The contrivance consists of a rectangular box fitted with a drop door, which is held open by a bar connected with the bait hook inside. A fish head usually serves to attract the cat.

It is important in attempting to attract birds to select properly the sites for their houses. Besides explaining in detail how to construct suitable nesting places for nearly all kinds of birds, the Department of Agriculture is circulating a booklet which treats this subject. Martins, for instance, prefer to breed near dwellings, but not closer than 20 ft. to either a tree or a building. Bluebirds usually choose open places where there are scattered trees. Catbirds, thrashers, and wrens like thick shrubbery, and robins large-trunked trees.

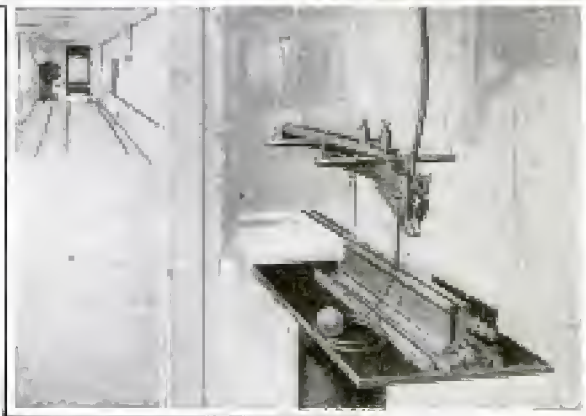
TESTING GUNPOWDER IS A 8727 DELICATE TASK

The demand for accuracy and uniformity in the powder used in rifles and shotguns makes it necessary for the makers to test every shipment of powder before it leaves the mills. These tests are made in the "ballistic house,"



Testing Apparatus in the "Ballistic House" of a Powder Mill: Rifle and Shotgun Mounted for Making Measurements of Recoil, Muzzle Velocity, and Pattern Formed by the Charge

where accurate devices enable the operator to measure the recoil of the test gun under the discharge, the velocity at the muzzle, the velocity at the target, and the pattern made by the charge when fired against a 30-in. circle. The guns used in making the tests are fired as carefully as a camera is exposed, and with the same kind of bulb and tube, in order to avoid giving any jar or movement to the gun at the instant it is fired.



Gun Mounted for Firing against a 30-Inch Circle: The Gun is Fired by Means of a Bulb and Tube

NEW STEAM RADIATOR WITH 7696m NOVEL FEATURES

Tests of a new steam radiator, recently patented, indicate that it has practically six times the radiating efficiency of the ordinary radiator. This radiator is designed to be placed in a horizontal position so that the air will pass up through it, and is made in sections of different sizes to suit the space available. For obtaining a large heating capacity with the use of the smallest possible floor space any number of sections, spaced about 4 in. apart, may be placed one above the other. Between the steam channels are pockets formed by transverse vertical partitions, while a horizontal partition,

pierced with an air hole, divides each pocket into an upper and a lower section, the arrangement being such as to give the air the greatest possible amount of contact with the hot metal as it passes up through the pockets. In



New Type of Steam Radiator of High Efficiency

this way, over 45 sq. ft. of radiating surface is provided for each 10 sq. ft. in the area of the radiator.

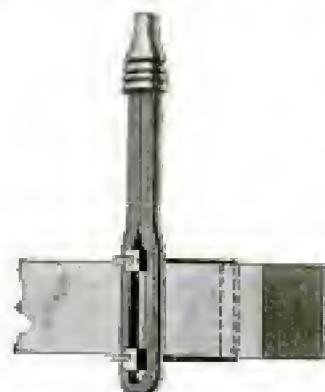
The Heating and Ventilating Magazine

June 1914
E. Carl Forster, 448 Soffle Rd., Hawthorne, N.Y.

NEW INSULATOR PIN FOR ELECTRIC LINES

8304

A metal insulator pin that is clamped in place by a U-bolt and thus does away with the necessity for boring



holes, a process that weakens the cross arm, is a new feature in electric-line construction. The pin is made from a galvanized-iron bar which is bent at the middle to bring the ends flat together, but is spread for five or six inches from the bend to form a slot for receiving the U-bolt. The flat end is equipped with a threaded cap, or with coiled wire, for holding the insulator. The U-bolt consists simply of a galvanized-iron strap that clamps around the cross arm.

THE SACRED COWS OF BALI AND THEIR HUGE BELLS

8505

In the island of Bali, one of the Dutch East Indies, near Java, the native New Year's festival, the most important fête of the year, is signalized by a race between the sacred cows. These beasts are decked out for the occasion with ornamental devices attached to their

horns, but their most striking decorations are huge bells, more than a yard across, made of ornamented bronze. The noise of these bells, as the cows are driven from post to post, arouses great glee among the natives. The photograph shows the sacred cows lined up for the start of the race.

PRIMITIVE WATERWORKS OF OLD NEW YORK

8590

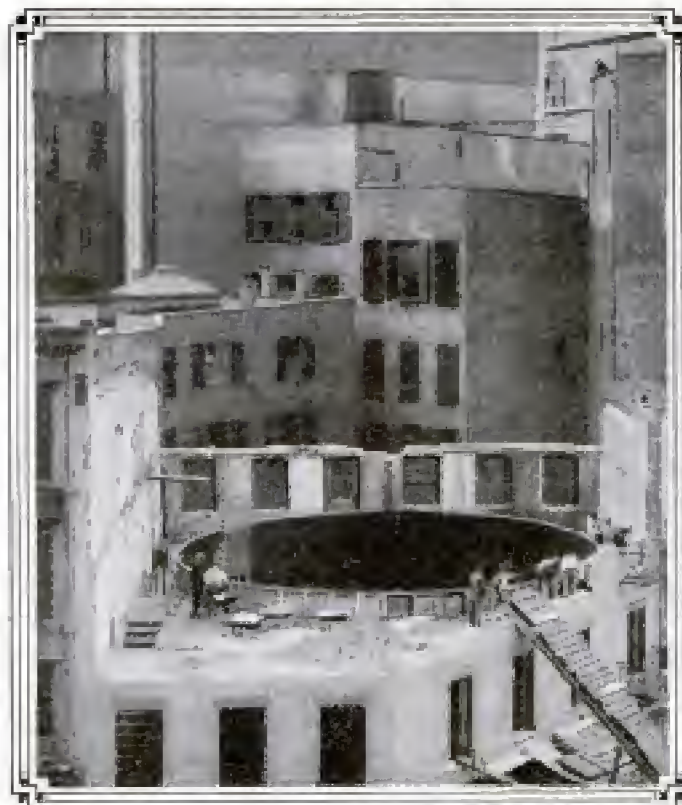
Quaint relics of a water-supply system over one hundred years old have been brought to light by recent excavations in some of the most populous sections of the city of New York. Several wooden gate valves, dating back to 1799—short sections of pine logs bored out axially and fitted with thick iron leaves working in a slot across the opening—have been unearthed; and the recent dismantling of an old building at Reade and Centre streets revealed a cast-iron tank which at one time supplied the entire city with water from a near-by well. The tank was constructed of cast-iron plates, bolted in position. They were imported from England.

The valves and the tank formed part of the water-supply system which was installed in 1799 after a scourge of yellow fever had swept the city. Aaron Burr was instrumental in having this system put in operation. With the desire of averting other epidemics of dis-



Huge Bells Worn by the Sacred Cows of Bali in the New Year's Race

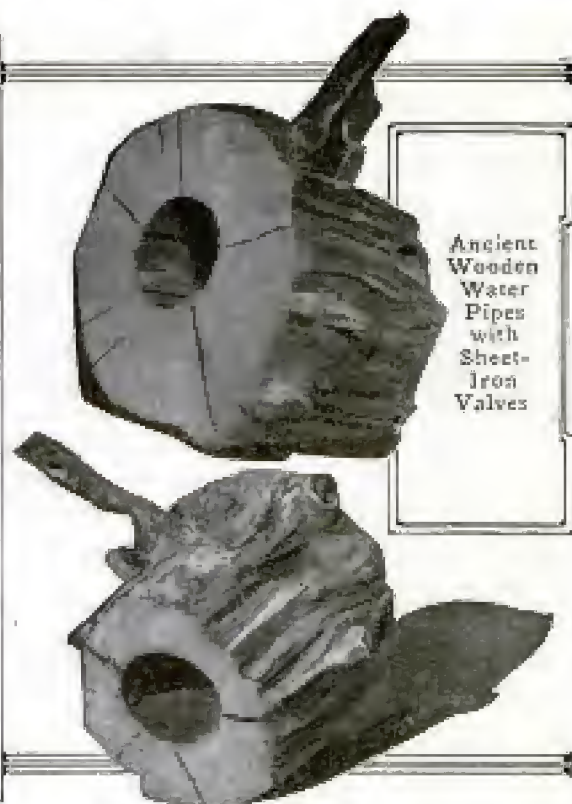
Henry Fuschim
108 Fulton St.
N.Y. City



Cast-Iron Tank More Than a Century Old Which Held Water for Old New York

case, he applied to the New York State Legislature for a charter "For purposes of supplying the City of New York with pure, wholesome water." When the reservoir was torn down, a black, slimy sediment, four or five feet thick, was found on the bottom, eloquently expressing the "pure and wholesome" quality of the water which had been pumped into it.

Two 18-hp. engines pumped 621,000 gal. of water a day into the tank, and, for distribution, hollow pine logs in connection with the wooden gate valves were employed. Twenty-three miles of wooden pipe had been laid by 1823, when the system was superseded by iron-pipe mains. Previous to this time, popular belief held that iron pipes were unhealthful. Only one short stretch of iron pipe and one iron valve were used. The iron pipe was the main conduit from the reservoir to the wooden mains; and the iron valve was connected halfway between the reservoir and the wooden mains. An effort was made to have the valve purchased by some patriotic citizen and placed in a museum, but without success, and



The First Metal Water Pipe and Valve

it has been broken up and sold for junk.

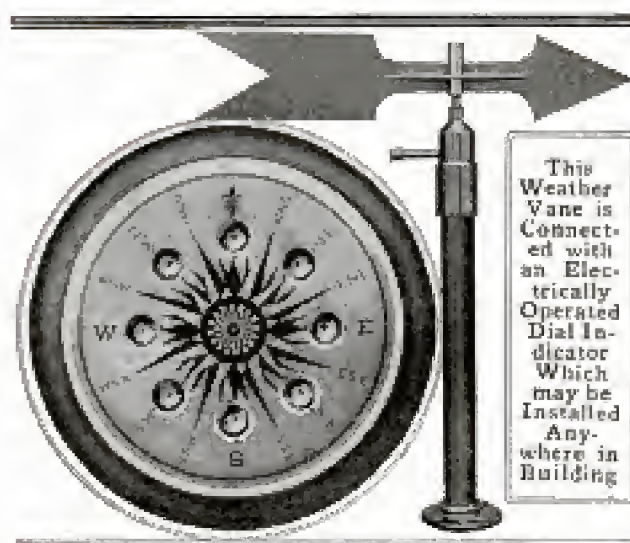
An interesting feature of the old pumping system was the charter under which it was operated. Owing to the fact that the installation cost could not be accurately estimated, the legislature, in a "joker clause," gave the Manhattan Company the right to employ all surplus capital in the purchase of public stocks, so that the Manhattan Company in a short time became noth-

32 Broadway, N.Y. City

ing more nor less than a banking institution with the water-supply system as merely an incidental issue. To this day, in order to hold its charter, the Manhattan Bank, now one of New York's largest financial institutions, must pump a certain amount of water each year.

DIRECTION OF WIND SHOWN BY ELECTRIC INDICATOR

82464 An electric weather vane registering the direction of the wind by illuminating small lenses at the major points of a compass-dial indicator, which may be

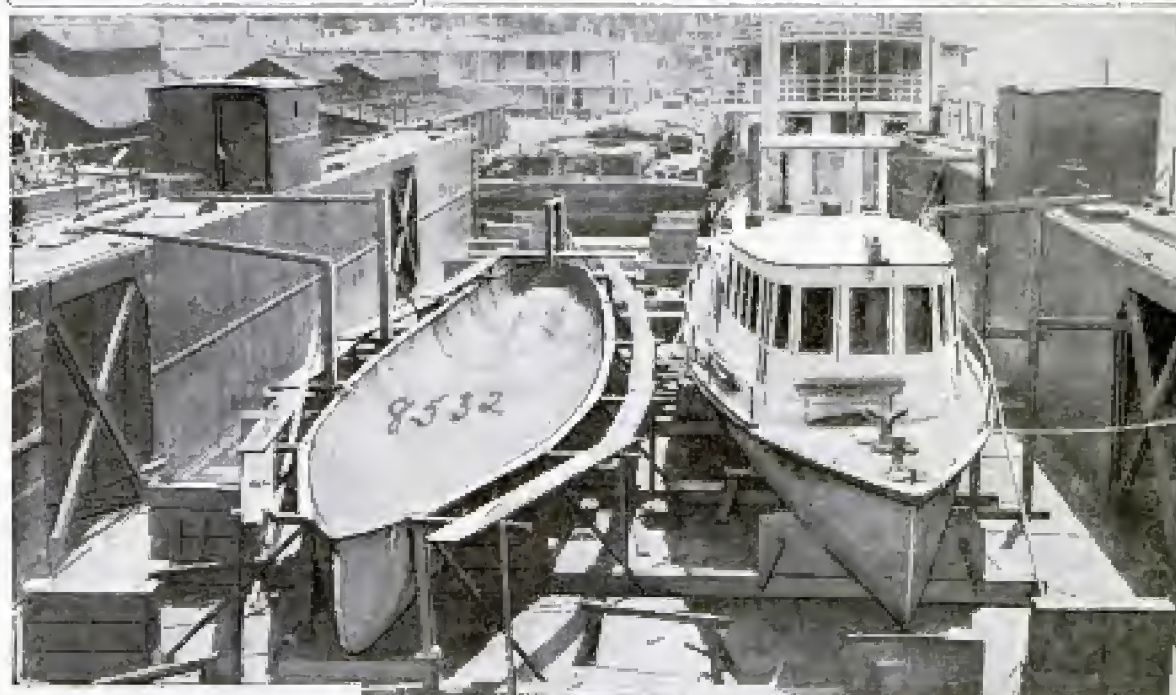
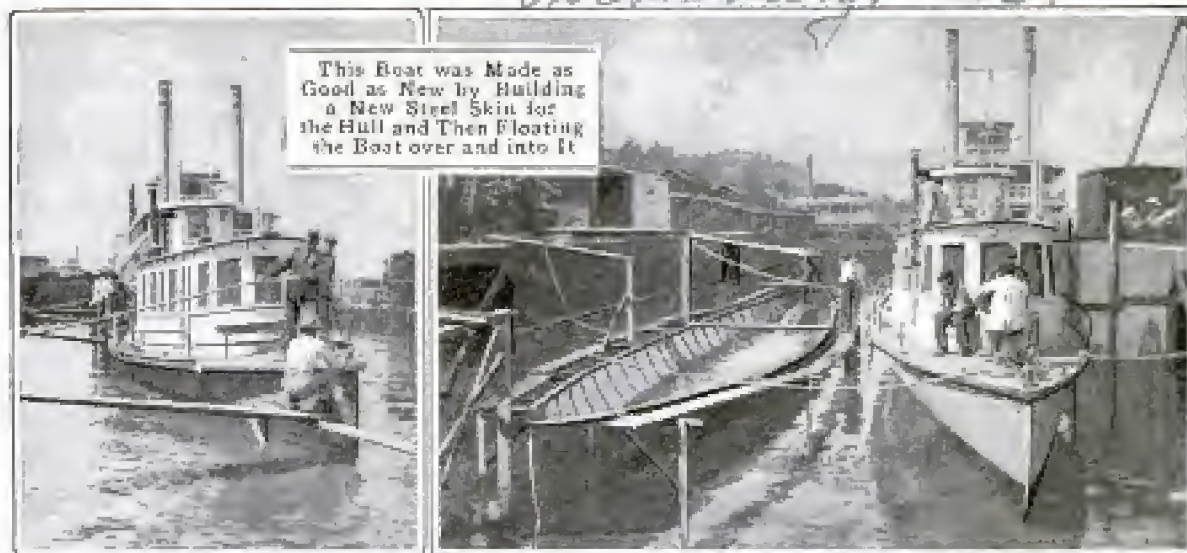


installed in any convenient place in a building or ship, has recently been invented. The purpose of the apparatus is to enable an engineer or navigator to observe the course of the wind without having to take his readings from the vane itself. An incased vertical shaft, on which the vane is mounted, revolves with it and carries a metallic brush which moves over a series of contact points, each of which is in a fixed position corresponding to one of the several points of the compass. As the brush touches one of these members it illuminates the corresponding lens on the indicator, showing that the wind, for instance, has changed from a northerly to a northeasterly direction.

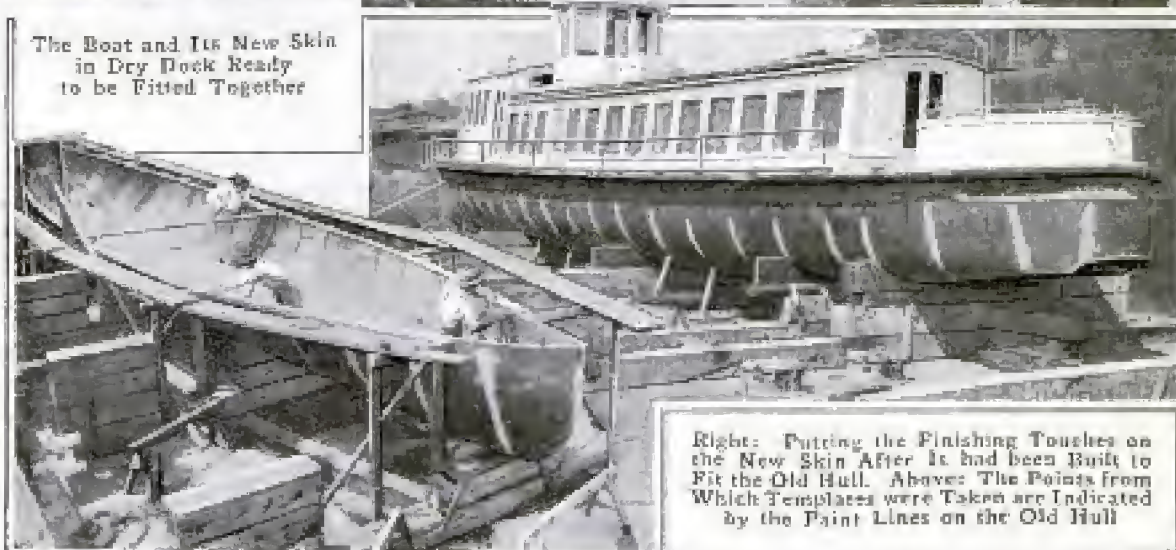
☞ Citizens of Philadelphia have shipped 1,900 tons of food to the Belgian war sufferers.

PUTTING A NEW SKIN ON AN OLD BOAT

8532 m A novel and successful process was used for putting a new skin on a government boat, the hull of which had worn thin from rusting and had begun to develop pinholes. This boat was built in 1897, was purchased by the government in 1902, and has been used since that time for inspection and light towing on shallow rivers. The hull as originally built had a length of 65½ ft., a beam of 10½ ft., and a draft of from 20 to 24 in. When the boat was 13 years old, the plates had become so thin from rusting that it was a common occurrence to knock a hole in the bottom during low water and sink the boat. This condition was met by a concrete lining. The inside of the hull was thoroughly scraped and cleaned, chicken wire was spread over the ribs, and cinder concrete to a thickness of from 4 to 5 in. was rammed down through the mesh. This lining, which increased the weight of the hull 8,000 lb., covered the entire bottom and extended up the sides to a level well above the water line. These repairs served the purpose very well for three or four years, but at the end of that time the plates had become so thin that it was feared the concrete lining would drop out through the bottom. A new steel skin was then put on the boat, with the result that the hull is practically as good as new. The boat was put in dry dock, and templates were made to fit the hull at intervals of 2 ft. From these templates a timber frame was built, and on the outside of this frame a new steel skin for the hull was formed, after which the timber frame was removed. The dry dock was then flooded, the boat was floated over the shell and the dock was raised carefully so that the boat was seated accurately in its new skin. After the water had been drained from the space between the hulls, this space was filled with melted paving pitch, and the new skin was securely attached to the old hull. With the removal of most of the old concrete lining, the draft of the boat



The Boat and Its New Skin in Dry Dock Ready to be Fitted Together



*Electrical Radiator Co.,
 64 of Congress St.,
 Portland, Maine
 120-122 Commercial St.
 B8 256
 12/16*

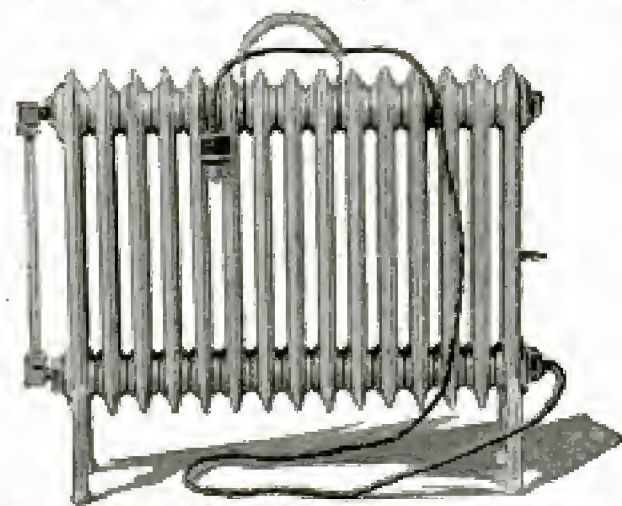
price \$1.00 sold by Hanes Sales Corporation, 179 W. Washington St., Chicago

POPULAR MECHANICS

was found to be 18 in. forward and 27 in. aft. The entire work cost about \$850, and it is expected that the new skin will last 12 or 13 years. A new hull would have cost from \$3,000 to \$4,000.

WATER CIRCULATES HEAT IN ELECTRIC RADIATOR

In an electric radiator that has just been brought out, the heat is distributed through the tubes by water that is



In This Electric Radiator, Water That is Heated by Resistance Coils Distributes the Heat through the Radiator Tubes

heated by resistance coils placed in the base of the radiator. A tube containing the coils runs lengthwise through the bottom of the radiator, and inclosing this is a second tube which is provided with openings for admitting the water. All that is necessary for using is to place a small quantity of water in the radiator and turn on the current. The film of water in contact with the tube containing the coil becomes heated quickly and passes upward in the radiator, and as the heating is continued a circulation of hot water through the radiator tubes is established. Under ordinary conditions the water will boil in from 15 to 25 minutes. One filling with water is sufficient to last for several months.

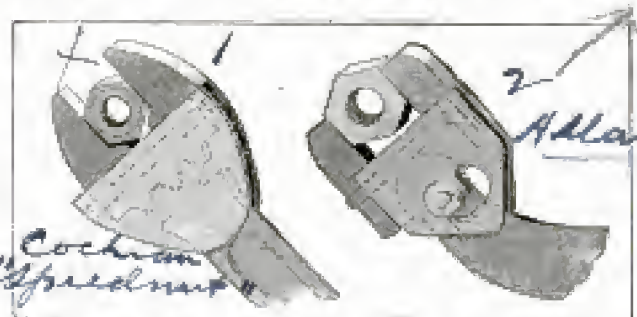
(Figures compiled before the outbreak of the European war showed Belgium's postal savings deposits to be three times greater than those of this country.

DANGER IN INHALING FUMES OF WOOD ALCOHOL

The dangers connected with the handling of wood alcohol and with working where even small quantities of the fumes of this liquid may be inhaled have been brought out prominently as the result of recent scientific investigations, which demonstrated that quantities of wood alcohol as small as .2 of one per cent in the inspired air may lead to the absorption of the product into the body to an injurious extent. With such quantities as this the absorption is slow, but eventually the body becomes "saturated" with it. The greatest danger in inhaling the fumes of wood alcohol is their effect on the optic nerve, which often results in total and incurable blindness.

WRENCHES THAT ARE SELF-ADJUSTING

Two self-adjusting wrenches that work in the same manner, but differ in construction, have been placed on the market. In both of these the jaws are tightened by a transverse push or pull on the handle, and both are so made that the harder the pull in tightening or loosening a nut, the harder the set of the jaws. In each, the base of one of the jaws slides in the base of the other. The tightening is accomplished in one of the wrenches by a ratchet movement, as shown, while in the other wrench the handle is pivoted to the base of one of the



With Either of These Wrenches a Pull on the Handle Automatically Tightens the Jaws against the Nut

jaws and has a circular bearing that works in a circular recess in the base of the other jaw.

*① Cochran Pipe Wrench
 info. C. F. Woodclaw
 Sole agent: 3000 Chgo.
 Hanes Sales Corp.
 179 W. Washington St., Chicago*
*② The Allan Self-Adjusting Wrench,
 price \$1.00 is intended to be sold by
 A. C. Allan & Co., 200 W. Washington St., Chicago.*



The White-Pine Shingles on This Maryland Home Are 168 Years Old

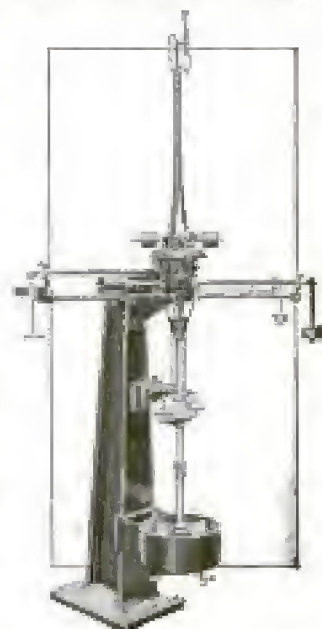
8587 **SHINGLES STILL PRESERVED
AFTER FIVE GENERATIONS**

White-pine shingles, 168 years old, are still intact and in a good state of preservation on an old residence at Bladensburg, Md. These, like the ones described in a previous issue of this magazine which served for 121 years on the First Parish Church of Bolton, Mass., were hewed by hand from native logs. So far as is known, the roof never once during the several generations of its exposure has required any attention whatever, and from its present appearance it is safe to assume that re-shingling will not be necessary for a number of years yet to come. The house is of historical interest in that during the battle of Bladensburg in 1813, a battery of British artillery occupied a position on the hill immediately behind it, firing directly over its roof.

9432 m **INSTRUMENT FOR STUDYING
THE AEROPLANE**

The study of the effects of the wind on an aeroplane, which is a part of the science of aerodynamics, is now carried out in a scientific way with models placed in wind tunnels, where any wind

effects that occur in the actual flight of an aeroplane are artificially duplicated on a small scale, and the resulting forces are measured by scientific instruments of the greatest accuracy. One of the most important of these measuring instruments is a new aerodynamic balance, developed in England, with which the amount of lift and drift, and of all forces that affect the lateral or longitudinal stability of an aeroplane under any wind conditions, or at any angle of flight with reference to the direction of the wind, may be accurately measured. Although it is rather complicated in construction, this



instrument simply measures the lifting power of the model, the forces acting along the lateral and longitudinal axes of the model, and the turning forces, or moments, about three

Engineering 5-15-14
Mr. Mann

axes, one of these axes being vertical, one at right angles to the direction of the wind, and the third parallel with the direction of the wind. These measurements are made by means of three beams, as shown in the illustration, these beams being placed respectively parallel with the three axes. The instrument is mounted underneath the wind tunnel with the vertical beam projecting into the tunnel, and on this beam the aeroplane model is mounted. Each beam is counterweighted and is equipped with measuring devices. With the aid of a handwheel the model can be rotated about two of the beams and thus placed in any position with reference to the direction of the wind. The instrument is so sensitive that the beams are affected by variations as small as .00002 lb. on the model.

Chicago Tribune
**WATER-COLOR BRUSHES MADE
 FROM HAIR OF COW'S EAR**

8572 An American manufacturer of water colors faced a business crisis when trade relations with Germany were interrupted by the European war, making it impossible to import camel or rabbit-hair brushes from that country. The company has always included one or more of these brushes in each box of its paints, and there was little doubt that the demand for the sets would cease when the brushes could not be furnished. Search for a substitute for rabbit hair resulted in the discovery that the hair in a cow's ears is as soft and strong as is needed for this character of brush material, and that it can be obtained without difficulty at the stockyards.

8466 m **SIGHT-SEEING AUTOMOBILES
 AID IN MOBILIZATION**

Along with every other kind of motor vehicle, the sight-seeing automobiles



COURTESY OF THE SKETCH
 A Sight-Seeing Automobile Used in Transporting Troops from the Interior to the East Coast of England

that form a familiar feature of the tourist's life in England have been pressed into service in connection with the European war, and, owing to their large seating capacity, have proved an invaluable aid in the work of mobilization. A 35-seater is shown in the illustration transporting troops from the interior to the east coast of England.

The Sketch

Scientific American
**LOWEST ORGAN TONE EVER
 PRODUCED**

8577 m A tone that is an octave lower than any ever before produced by an organ is given out by a 128-ft. pipe installed in a new pipe organ at Lowell, Mass. This tone is described as "a mighty atmospheric throb of awesome majesty." The lowest tone heretofore produced by an organ was produced by a combination of stops giving the effect of a 64-ft. pipe. The fundamental tone of a 32-ft. open pipe has 16 vibrations to the second, and this has been regarded as practically the low-

est musical tone the human ear can perceive. The new pipe produces only four vibrations to the second, and for this reason it is said that the tone must be felt rather than heard.

Seventy-two kinds of wood are being employed in making umbrella handles, whips, and canes in the United States.



An Electric Sign Which Talks in Letters 12 Feet High While Delivering a 150-Word Advertising Speech

"TALKING" ELECTRIC SIGN

BIG CHEESE FOR EXHIBITION

8242 LARGEST OF TYPE

8694 AT SAN FRANCISCO

The largest electric "talking" sign ever constructed has been erected at a vantage point on Michigan Avenue in Chicago, where it is seen by thousands of persons nightly. The board is 150 ft. long and 50 ft. high, and displays its message in letters 12 ft. in height. Set in regular lines over its face, on a series of perpendicular boards, are more than 7,000 electric-light globes. The feature of the sign which removes it from the ordinary is that it is capable of exhibiting 150 words of text in illuminated letters which may be read blocks away. Each one of the lamps is connected with separate wires, and running between the contact points of these on a control board is a roll of perforated paper. Whenever a hole in this ribbon permits two of the contact points to meet, a circuit is completed and one of the many lamps is lighted. So, as this perforated strip passes over the control board, the letters punched in it are correspondingly shown on the sign and move over it from right to left as the roll crosses the operating board. Since the principle is essentially the same as that of a player piano, it is possible to change the advertisement daily by inserting a new roll.

A cheese that weighs between five and six tons, and is nearly 5 ft. high and more than 6 ft. in diameter, has been made in New York State for exhibition at the Panama-Pacific Exposition. The intake of 25 factories for a day, amounting to about 106,000 lb. of milk, was used in the manufacture of this enormous cheese. It was made in a mold built up of galvanized-steel hoops. At the close of the exposition, the cheese will be cut into pound pieces and sold. This is an unusually large cheese, but



This Cheese, Weighing Between Five and Six Tons, will be Exhibited at the Panama-Pacific Exposition

Elmer E. Laycock
The Syracuse Herald
Syracuse, N. Y.

Made by H. A. O'Connell, N. Y.

Large & 200 ft. high. Chgo.

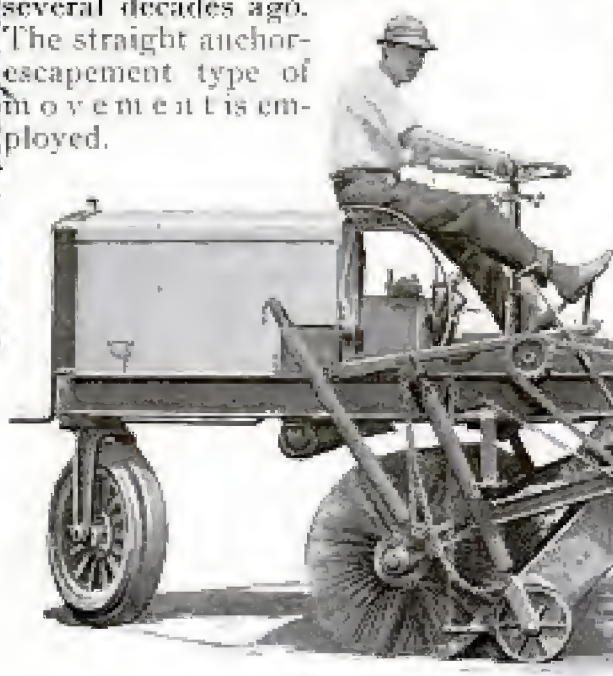
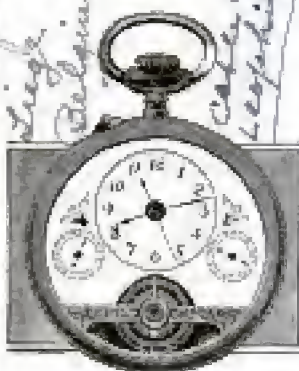
not the largest ever made. A cheese made in Canada and exhibited at the World's Fair in Chicago weighed 11 tons, was 6 ft. high, and nearly 9 ft. in diameter.

EIGHT-DAY WATCH PRODUCED BY BELGIAN MAKER

One of the few real innovations to make its appearance in the watchmaking industry in recent years is an eight-day timepiece which has lately been introduced by a Belgian firm. An advantage claimed for the instrument is that it is so built that it cannot vary in time more than one minute during the period it

runs on a single winding. Pivoted in the center of the dial is a thin hand which splits the seconds into fifths, the same as a stop watch. Another feature of the piece is that it shows the days of the week and month, as did most of the old grandfather clocks of several decades ago.

The straight anchor-escapement type of movement is employed.



Motor-Driven Sweeper Which Both Sprinkles and Cleans a Pavement in One Operation

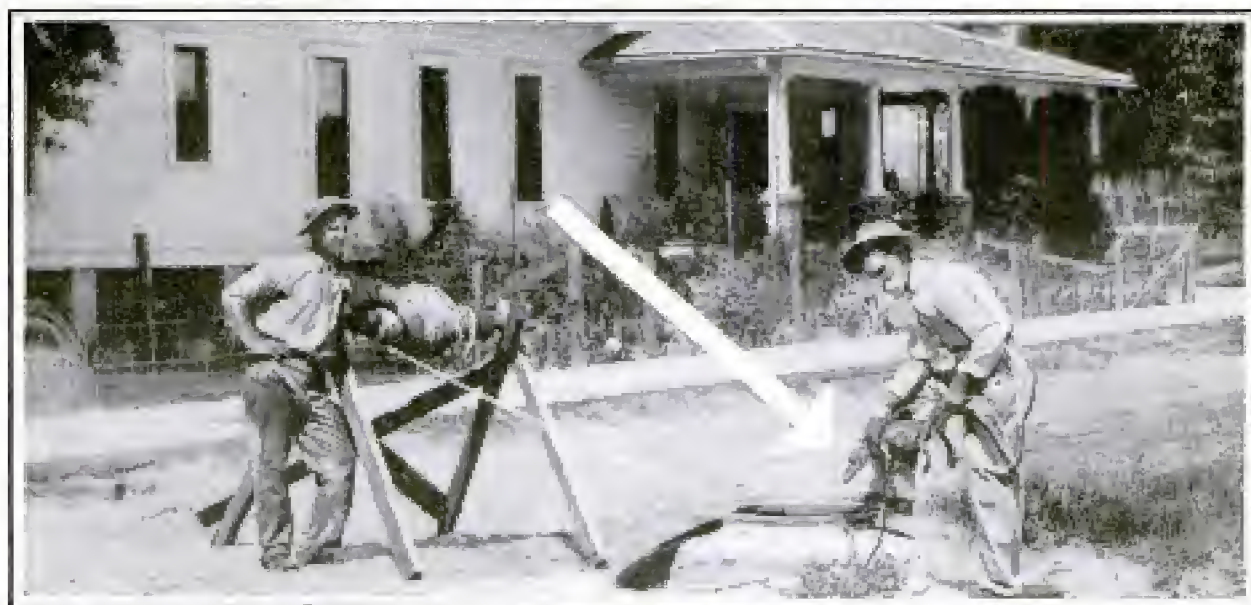
ZEPPELIN FACTORY DAMAGED BY BRITISH AIRMEN

According to newspaper reports the Zeppelin airship factory, located on the shore of Lake Constance, was seriously damaged on Nov. 21, 1914, by bombs dropped from British aeroplanes. In making this raid the British airmen started from French territory and were compelled to make a flight of 250 miles over mountainous country under difficult weather conditions. The raiders penetrated about 120 miles into German territory.

SWEeper COVERS BIG AREA IN SHORT TIME

A combination street cleaner which sprinkles and sweeps a pavement in one operation, has recently been developed and is now in use at Springfield, Ohio. The machine is built on a three-wheel motor truck which propels it at a moderate rate of speed, sufficient to make it capable of covering 140,000 sq. yd. of street surface in a day's time. It carries a water tank having a capacity of 200 gal. As the sweeper moves along, the pavement in the path of the revolving brush is sprinkled enough to prevent raising a cloud of dust. The dirt is swept by the brush into a conveyor which carries it into a compartment built at the front of the car.

Ralph G. Busby



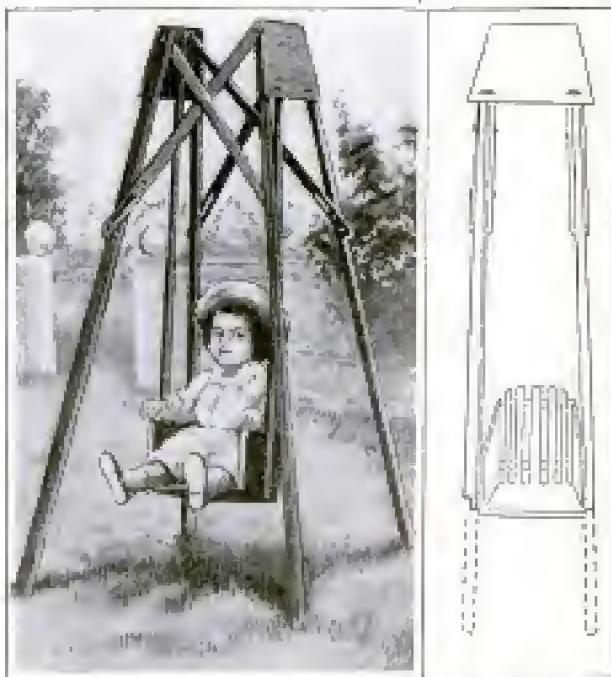
When a Sewer is to be Cleaned in Fort Meade, Florida, an Alligator Carries the Scraper Line Through from One Manhole to the Next

ALLIGATOR AIDS IN SEWER CLEANING

8708m

The problem of getting a line through sewers that are to be cleaned has been solved at Fort Meade, Fla., by taking into the sewer-cleaning department a tame but very active alligator named "Nick." When a small sewer is to be cleaned, it is first necessary to get a line through from one manhole to the next for pulling a scraper. This is where Nick shows his real worth. The line is simply tied around Nick's body and he is lowered into the manhole and headed in the right direction, and when he reaches the next manhole he is lifted out. The scraper does the rest. It is said that Nick is better for the job than any mechanical crawler, as he never fails to dig his way through.

suspended from the top cross bar, is made to close like a folding chair. A bar which fits across the front of this holds a child so that there is no danger of its falling or being injured when left unattended. The legs are braced firmly



When Not in Use This Swing may be Folded Compactly and Stored in a Small Space

to prevent the device from tipping over, so that it may be used on a lawn as safely as in a sun parlor or room.

CA net revenue of about \$67,000 accrues annually from the town forest of Baden-Baden, Germany.

*Made by Brownstown
Lumber Co., Brownstown,*

Copyrighted material

CHILDREN'S FOLDING SWING ADAPTED FOR CITY FLAT

8365

A child's swing which is particularly designed for use in city apartments and homes where there is a minimum of storage space, has lately been constructed. It may be folded compactly, and although made of light wood, is strong and serviceable. The supporting frame, which is quite similar to that of a stepladder, is approximately 4½ ft. in height, and the swinging seat,

*R. C. Clester
Franksville, Ind.*

W. S. Branch
Orlando, Fla.

Made in Detroit, U. S. A.
Committee.
Detroit Board of Commerce
Detroit Mich.

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POPULAR MECHANICS

Peoples Nat. Bank of Orlando
CLOCK ON DOOR SHOWS WHEN

8:18 AM BANK IS OPEN

A clock fixed to the front door just below a sign giving the banking hours is the plan adopted by a bank in Oran-



This Clock is Fixed to the Bank Door just below a Sign Giving the Banking Hours

do, Fla., for indicating that the bank is open, or is closed. This plan was adopted mainly on account of early customers who were inclined to try the door impatiently a few minutes before the opening hour. The clock has an alarm which notifies not only the waiting customers, but the employees as well, when it is time to open the doors.

DESIGN FOR "MADE IN U. S. A." TRADE-MARK WANTED

Mainly as a result of the European war and the consequent radical reduction in imports, a strong movement has taken form having for its object the substitution of goods made in this country for those formerly imported from Europe. One feature of this

movement is the "Made in U. S. A." trade-mark that the Detroit Board of Commerce is preparing to bring out. In order to obtain an appropriate symbol for the purpose, this organization has offered a \$500 prize for the best design. The contest closes Feb. 25, 1915, and any native-born, or naturalized, citizen of the United States is permitted to compete. The design selected is to become the property of the people of the United States, and will be recommended to manufacturers throughout the country. It must be national in character and without any strictly local features. In this contest all drawings must bear the words "Made in Detroit, U. S. A.," with the idea that the names of other cities will be substituted as required after a national trade-mark has been selected.

LONG-STROKE MOTORS COMING INTO FAVOR

The small-bore, long-stroke motor has long been popular with automobilists in Europe, but has only recently begun to attract any considerable attention in this country. The principal advantages ascribed to the long-stroke motor are that it yields more power for a given consumption of gasoline because of the greater expansion of the gases, and that it gives a greater "throw," and therefore a greater leverage on the crankshaft. At the same time these motors have their disadvantages. It is usually necessary to keep the engine speed up, no matter what the car speed, and this calls for a greater use of gears. The small-bore motor also calls for a more careful manipulation of the ignition. These motors also require better materials and more careful workmanship in manufacture. In spite of these drawbacks, however, the small-bore, long-stroke motors seem to be gaining in popularity also in this country.

Of 69 awards recently made by the Carnegie hero-fund commission, 19 went to Ohio.

The Motor, Nov. 1914

Sent out by Detroit
Board of Commerce
see Top 2d col.

FIGHTING IN EVENING DRESS ON EUROPE'S BATTLE FIELDS

How the Soldiers of the Various Warring Nations are Uniformed—The Contrast between the Indistinct Gray Costume of the German Troops and the Flashy Attire of the French—What the Scotch Highlander, the Russian Cossack, the Spahi, the Austrian Jaeger, and the Chasseur d' Afrique Wear to War

WITH the possible exception of the German forces, some part of the soldiers of every one of the warring nations of Europe are fighting in their dress uniforms. Only in one instance was any of the powers prepared at the opening of hostilities to clothe in service uniforms all the men they poured into the field. When war was declared, Germany had four million new service uniforms, that the public had never before seen, ready for its men.

On parade, the British soldier is the most elaborately groomed of any in the world, but in the trenches his regular uniform goes to the extreme of plainness, made of khaki-colored serge. The jacket, or tunic, has large patch pockets and a double collar, with breeches and putties of the same color, a peaked cap, and a greatcoat or mackintosh.

In the different arms of the British service the dress uniforms vary greatly. In the cavalry, the guards and dragoons wear steel helmets, while the dragoon guards wear brass headgear. Scarlet tunics are worn by guards and dragoon guards, while the lancer is distinguished by a double-breasted blue tunic, and a cap fashioned after the

Polish czapka. Hussars wear short blue tunics, elaborately ornamented with rows of gold-braid "frogs" across the breast, with plumed busbies varying in color according to the regiment. Blue trousers and jack-boots are worn by all cavalymen excepting those in the king's guard.

The English line, light, and fusilier-infantry uniform consists of a red tunic with pointed cuffs, red shoulder straps, gold buttons, and white piping. The trousers are blue with red stripes. Blue helmets with brass spikes are worn by line infantrymen, while the light infantry has green helmets. Tunics and trousers of dark green are worn by the rifle regiments.

The Scottish Highlander still refuses to exchange his kilts for trousers. With the exception of the Scottish Rifles, who are known by their green doublets and a shako with a black plume, all Lowland and Highland regiments wear scarlet doublets. The latter wear tartan kilts, loose plaids, and ornamental sporrans, checked-topped stockings, and white spats. The Lowlanders wear plaid trousers, and the Kilmarnock bonnet,



One of the Plainest Service Uniforms of Any Foreign Army Is the Khaki Costume of the British Soldier



The Dragoon Regiments of the British Cavalry Carry Straight Swords of the "Cut and Thrust" Pattern



The Scotch Highlander has Never been Persuaded to Substitute the Trousers of the Lowlander for His Kilts

while the Highlanders wear the "feather bonnet." In the service uniforms the kilts are khaki color.



While the Above Uniform Is a Typical One, the Costume of the Indian Soldier Often Varies According to His Caste

Long-skirted tunics without collars, but with full-length sleeves, trousers, putties, and turban, roughly describes the costume of the Indian troops. Blue is their general color, but the uniforms are not regular in detail, differing according to the various castes.

In the French line infantry a single-breasted blue tunic with its collar, cuff flaps and shoulder straps in red; baggy madder-red trousers, tucked in ankle boots or worn with heavy hobnail shoes and gaiters; red kepi with a tricolor cockade and ball; blue band and brass ornament, and a heavy blue-gray great-coat, cut away from the waist to the knees, constitute the uniform. The same style of tunic is used by the chasseur battalions, with different colors of trimmings. The trousers, how-

ever, are blue-gray with yellow piping, and the kepi dark blue with yellow braid. The dress of the French Zouaves is distinctly Moorish in style, having short, dark-blue jacket with red trimmings, extremely baggy, knee-length trousers, white spats and tasseled cap. The Turcos dress similarly, excepting that their trousers are usually either white or blue.

French cuirassiers, hussars, dragoons, and chasseurs à cheval have red trousers tucked into boots, and blue tunics. The cuirassiers are protected by heavy steel breast and back plates, and wear a steel helmet with brass ornaments, black horsehair tail and sometimes a red "shaving brush" at the front and side. Dragoons also wear helmets with tails. The red kepi is the service head-dress of the chasseurs. A half-open vest of light blue with yellow collar, a red sash and trousers to match, is the attire of the chasseurs d'Afrique. The Spahis wear red jackets and baggy blue trousers tucked into red morocco boots. A flowing mantle covers head and shoulders. French artillerymen wear black-braided, blue dol-



The Turcos, or Members of the Algerian Infantry of the French Army, are Uniformed Essentially the Same as the Zouaves

mans, with red shoulder cords and red collar, and trousers of the same color.

Green is the predominating color of Russian uniforms. Double-breasted tunic and knickerbockers, high, black boots, and a flat-topped cap is the customary uniform of the infantry. The heavy grayish-



Cuirassiers of the French Cavalry are Always Identified by Ornate Steel Helmets and Heavy Cuirasses



The Flashy Red and Blue Uniform of the French Infantryman Makes Him a Very Conspicuous Target for the Enemy

brown, waterproof overcoat is lined with sheepskin and fitted with a head cape. In summer, a light blouse of white linen replaces the tunic. Shoulder straps and cap bands vary according to regiments. The Russian line dragoon wears trousers of blue-gray cloth and a peaked cap. The Russian soldier wears footcloths instead of socks.

Cossacks wear long, loose caftans, dark blue for the troops of three of the divisions, but dark green for the rest. A cloth-topped, conical lambskin cap is worn, except by the Caucasus regiments, which dress in dark-brown caftans and have a full headdress, not a cap. The guard regiments have short tunics, either blue or red. The czar's personal escort dresses in scarlet, gold-braided caftans, white waistcoats and blue trousers. The guard regiments wear spurs, but the other Cossack regiments carry whips instead. They carry curved swords without guards, while some

coat, loose trousers tucked into high laced boots, and cap of kepi pattern. Overcoats are the same color. On

dress occasions, a bearskin shako is worn by some corps of guards. Belgian cavalrymen wear blue or red tunics, while the headgear varies, the lancers wearing the uhlan czapka, the chasseurs the kepi, and the dragoons a helmet and

occasionally a shako. The light artillery has red trousers, long blue coats, and high boots.

Most of the German troops are fitted with service uniforms of a gray that blends so completely with the landscape that, at a short distance, it is difficult to de-

tect the presence of a body of soldiers. The cut of the uniforms varies in the different arms. Some of the infantry forces, however, are wearing dark-blue tunics, gray trousers piped with red, Wellington boots, black leather helmets, and gray greatcoats. Like the Russians, they wear footcloths



With the Exception of the Guard Regiments, Russian Cossacks Never Wear Spurs, but Instead Carry Long Whips



The Spahis, Forming the Native Algerian Cavalry, Which is Commanded by French Officers, Wear a Red, White and Blue Costume

of the regiments also have daggers. The men of the front rank are armed with 9-ft. cavalry lances.

Dark-green tunics, trousers and caps, with red shoulder straps and piping, is the uniform of the Russian artilleryman. Black collar and cuffs, edged with bright red, distinguish the guard artillery.

The Belgian line infantry is uniformed in blue with double-breasted



Dark Green Is the Predominating Color for Both the Dress and Service Uniforms of Nearly All the Russian Land Forces



The Blue Uniforms of the Belgian Soldiers Bear a General Similarity in Cut to Those Worn by the French Forces

instead of socks. The sharpshooters, known as jaegers, are identified by shakos with drooping plumes, green tunics, and gray trousers.



Germany's Gray Uniforms Make Its Soldiers the Most Inconspicuous of Any on the Battle Fields of Europe

Iron and brass cuirasses and high tan boots are worn by the German heavy cavalry, with burgonet-shaped helmet, and blue tunic with gray trousers. The dragoons and

Bavarian heavy cavalry have tunics of light blue, trousers of still lighter blue, and black leather helmets with horse-hair tails.

The German hussars are noted for their rich costumes, decked with ornaments and trimmings. They wear tunics of a variety of colors, fur busbies, gray trousers with lace stripes, Hessian boots, and white pouch belts. The color of the braid and lace marks the identity of the regiment. A dark-blue tunic, with girdle and piastron, gray trousers,

and a czapka characterize the uhlan lancers. Lances are carried by all cavalrymen. Nearly all of the German artillery regiments wear dark-blue coats and gray trousers.

In the armies of Austria-Hungary, the infantry uniform consists of a dark-blue tunic, cut single-breasted; trousers of a lighter color, and a cap of the same shade patterned after the kepi. A plain blouse with no shoulder straps, or a jacket, replaces the tunic as a service dress, while the cap worn in the field is cylindrical. The differences between the Austrian and Hungarian uniforms

are merely of detail. The jaegers wear broad-brimmed felt hats bearing plumes on the left side, and tunics and trousers of dark green mixed with gray. Austrian dragoons wear blue jackets and red trousers, crest helmets, and a short, fur-trimmed jacket, called a pelisse. The hussars wear dark jacket and pelisse, with gold-braid bars across the chest. The trousers are red and tighter than those of the dragoons. The shako, with a "shaving-brush" plume at the front, is generally worn. The Austrian uhlan wears a uniform not greatly different in appearance from that of the dragoon. The artillerymen wear maroon tunics, light-blue trousers, and a cap of about the same shade.



The Hungarian Uniform Differs Only Slightly from the Blue Costume of the Austrian Infantryman, Which is Shown Here



These Military Boots Represent the Types of Footwear Worn in Service by Infantrymen of Europe's Armies



Building the Bridge to Island Mountain Tunnel: The River Takes Eight Miles to Get to the Other Side of the Mountain While the Tunnel Goes Through in 4,300 Feet

RAILROAD TUNNEL THROUGH ISLAND MOUNTAIN

8145
A curious phase of railroad construction is the Island Mountain tunnel on a railroad just built in California. This mountain gets its name from the fact that it is almost entirely encircled by a river which takes eight miles to go from one side of the mountain to the other. By means of the tunnel the railroad gets through to the other side in 4,300 ft. The bridge over the river extends up to the precipitous face of the mountain so that a train passes directly from the bridge into the tunnel.

ELECTRIC SIGNAL DEVICE FOR MOTOR CARS

8409
For the purpose of informing pedestrians in front of a motor car, as well as traffic at the rear, of the course it is to pursue at a street crossing, an electromagnetic signal has been devised which is operated by a couple of push buttons on the steering wheel. The indicating members of the apparatus consist of two arrows several inches in length, one of which is mounted on the radiator and the other over the tail

lamp of a machine. When the arrows point toward the ground they show that the driver intends continuing straight ahead, but by pressing one of the buttons the two pointers are drawn to the right, or left, as the case may be, announcing that the car is to turn in the direction indicated. The moment pressure on the button is removed, the



These Arrows, Operated Electrically, Indicate the Course to be Taken by a Motor Car at a Street Crossing

arrows drop back to their normal positions. At night time when the signals are being operated they are illuminated by small incandescent lamps.

replied Johnson, Editor,
Cement World,
1827 Prairie av., Chicago, Ill.

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POPULAR MECHANICS

Leaflet sent out by Dept. of Interior,
Bureau of Mines. Written by Albert
H. Fay & entitled "Production of Ex-
posed in the U. S." during the
year 1918

84915. SNAKES PROVIDED WITH CONCRETE HOUSES

A snake farm where the reptiles are provided with concrete houses is an odd institution maintained by the gov-



COURTESY CEMENT WORLD
A Brazilian Snake Farm Where the Serpents Live
in Concrete Houses

ernment of Brazil at São Paulo. It serves the double purpose of providing a supply of material for the production of serum antidote for snake bites and of educating the public to the fact that all snakes are not venomous. The "farm" is surrounded by a concrete wall high enough to keep the snakes

from crawling out, but low enough for visitors to see over. Inside the wall is a water-filled trench, also lined with concrete, while concrete walks connect the snake houses. At night the snakes are herded into these dome-shaped structures and the doors are closed. In the morning an attendant wakes up the reptiles by prodding them with a stick through a hole in the door, after which the doors are removed and the snakes come out for their morning bath in the trench.

8628. EXPLOSIVES CLASSIFIED BY MINES BUREAU

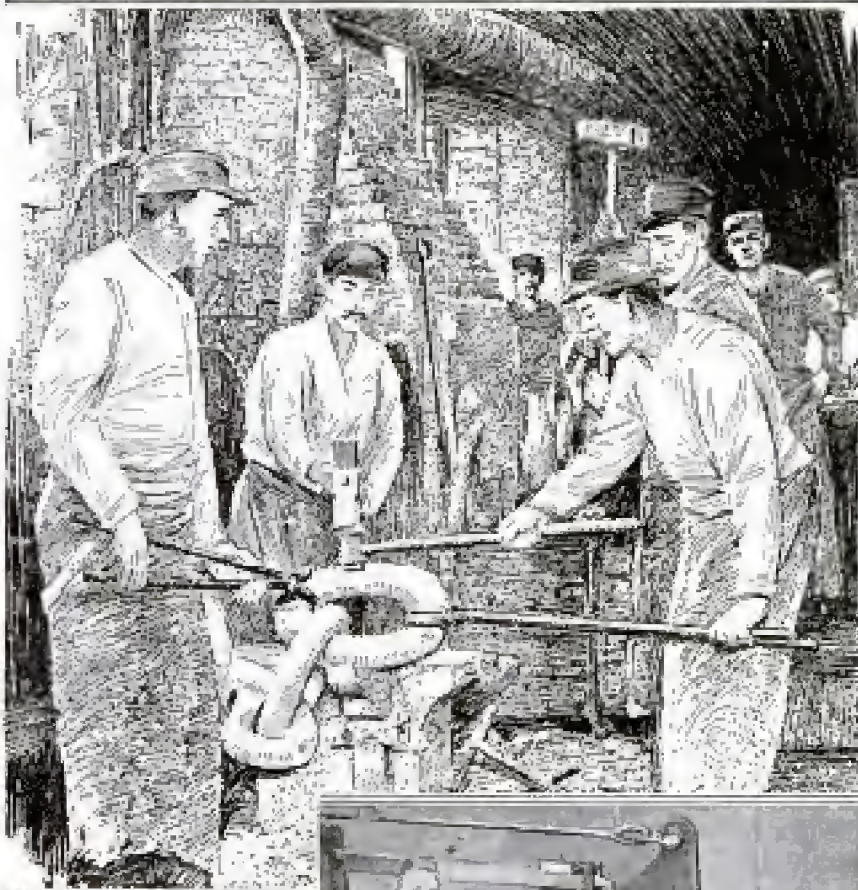
Under the classification made by the U. S. Bureau of Mines, explosives used in mining and blasting are classified under three heads. Black blasting powder includes all black powder having sodium or potassium nitrate as a constituent. In the class of high explosives are included all dynamite or other high explosives with the exception of permissible explosives. Permissible explosives are those that have passed safety tests specified by the Bureau of Mines.

8321. HOW SHIPS' CABLES ARE MADE AND TESTED

The most important center in the United States for the making of chain cables for seagoing vessels is an inland city, Columbus, Ohio. Curiously enough this industry had its origin in contract work done in the penitentiary. The industry simply spread beyond the prison walls and has flourished under free labor for many years. Large cables are made entirely by hand by expert blacksmiths. Each link is formed from a rod of iron, 32 in. long and nearly 2½ in. in diameter. One of these links weighs 50 lb., and a 90-ft. cable weighs as high as 5,500 lb. Before a cable leaves the factory it is always subjected to a test in which the weakest link in the chain is destroyed. The chain is laid in a long steel trough imbedded in the floor. One end is attached to a powerful testing machine

and the other to an anchorage at the opposite end of the trough. The test consists in pulling on the chain until one of the links snaps and in determining, from an indicator on the testing machine, at what tension this occurs. When the link snaps under the test, fragments are often thrown violently to all parts of the room, and for this reason only the men required for operating the machine are allowed to remain in the room, and these are protected by a heavy wooden barricade. The force registered usually runs from 250 to 375 tons. Following the test, the broken link is replaced and the end links are marked with an iron stamp to show the strain at which the cable parted. The cable is then rolled on an enormous iron spool, dipped in a black coating, and is ready for shipment.

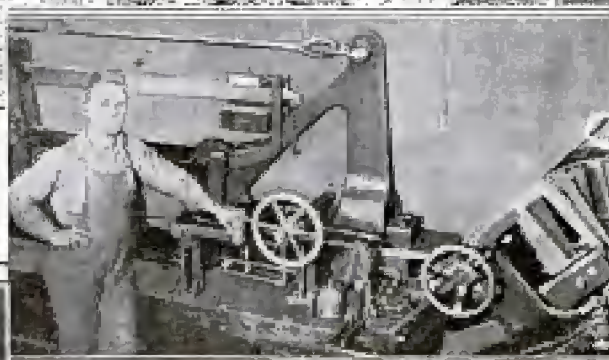
C. C. Johnston, 1108 Brunson Bldg.,
Columbus, Ohio.



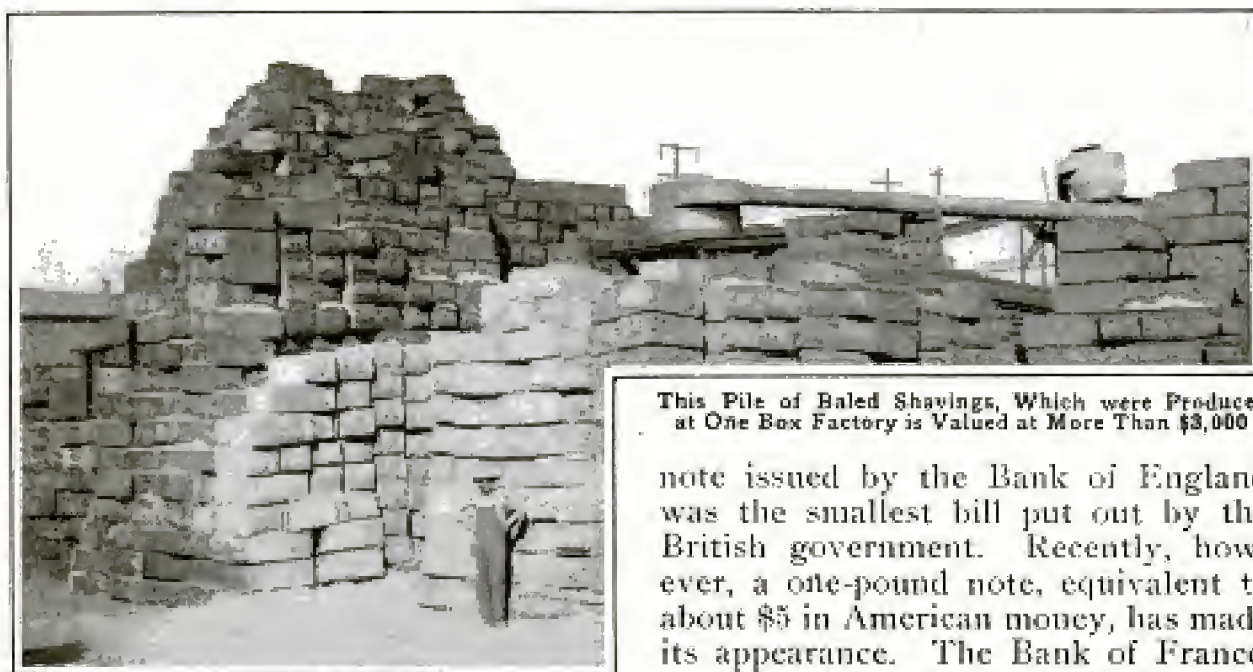
Links for the Chain Cables of Seagoing Vessels are Made by Hand from Iron Rods 32 Inches Long and Nearly $2\frac{1}{2}$ Inches in Diameter



Chain in Steel Trough Ready for the Breaking Test. View of Testing Machine at Left



Scene in the Blacksmith Shop of a Chain-Making Establishment: The Completed Chain Shown in This Picture is Made to Withstand a Breaking Strain of from 250 to 375 Tons



This Pile of Baled Shavings, Which were Produced at One Box Factory is Valued at More Than \$3,000

SHAVINGS A BOX-FACTORY BY-PRODUCT

The shavings which are produced in large quantities at box factories are often regarded as waste material and burned. One large factory in California has turned this waste material into a profitable by-product by baling and selling it. The shavings are used principally as a mulch for orchards, and as bedding for horses and cattle, and there is a ready market for all the shavings produced when they are put in convenient form for handling by baling. They are baled in a specially designed baler somewhat similar to an ordinary hay baler. More than \$3,000 worth of shavings are contained in the piles shown in the illustration.

SMALL BANK NOTES ISSUED IN FRANCE AND ENGLAND

In order to meet the financial crisis caused by the outbreak of the European war, both Great Britain and France have made large issues of emergency currency which is now in general circulation. In each instance paper money of much smaller denominations than that previously in existence in the two countries, has been introduced. Heretofore the five-pound

note issued by the Bank of England was the smallest bill put out by the British government. Recently, however, a one-pound note, equivalent to about \$5 in American money, has made its appearance. The Bank of France, on the other hand, regularly issued nothing smaller than a 20-franc note, which in our money represents \$4. At the opening of the war a five-franc bill was placed in circulation by that institution, while shortly afterward a two-franc note was placed in circulation by the town of St. Quentin. After the Germans had passed through Epernay, France, and taken most of the available money with them, the mayor of that place authorized the issue of notes in denominations as small as 25 and 50 centimes, or five and ten cents.

NEW METHOD OF MENDING BROKEN BONES

A new method that has just been announced for hastening the repair of fractured bones consists in injecting into the fracture a mixture made of granulated bone and petroleum jelly, or petrolatum. A fresh piece of bone is dried, ground to powder, mixed with petrolatum to the consistency of paste and then sterilized. After the fracture is located, a hollow needle is pushed through the flesh to the bone, and the paste is injected between the broken ends by means of a hypodermic syringe.

An Oklahoma oil company is contracting to supply the British government 15,000 barrels of crude oil a day.

Illustrated London news

Chicago Record Herald

See January 10, 1907 *G. H. Davis, Jr.,*
15 Putnam Ave.

POPULAR MECHANICS *Braintree, Mass.*
Scientific American
LIQUID OXYGEN AS AN
EXPLOSIVE

8756 *m*
A practical method of making use of the explosive quality of liquid oxygen, a quality it has long been known to have when mixed with certain substances, has recently been discovered. This method consists simply in filling bags with a special form of lampblack and then soaking them thoroughly in the liquid oxygen just before they are required for use. If the soaked bag is lighted with a match, it burns harmlessly, but if detonated, it explodes with the force of dynamite. There is little danger in case of misfire, as the liquid oxygen evaporates in a few minutes.

8376 *m*
PANAMA CANAL AT NIGHT IS
A BEAUTIFUL SPECTACLE

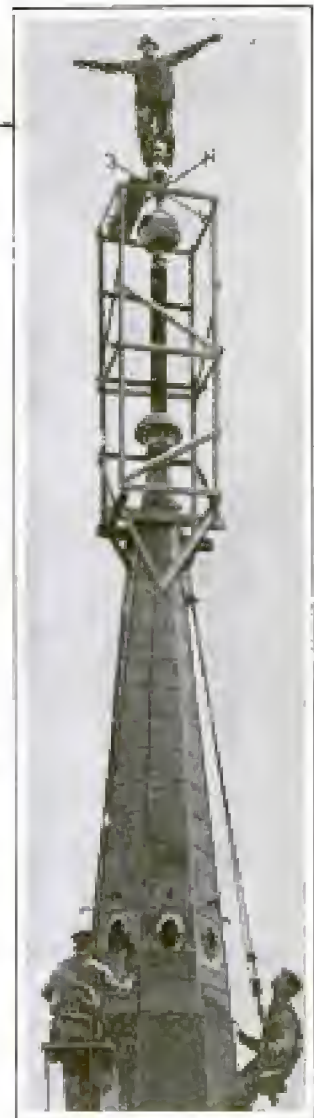
Striking night effects are produced by the rows of powerful electric lights that line the side and center walls of the Panama Canal locks, as will be seen from the illustration showing the ordinary working illumination of the Pedro Miguel locks. This effect is duplicated at each of the other two sets of locks, while similar lights spaced at greater distances apart serve to mark the channel from end to end of the canal and make navigation as safe by night as by day.



The Pedro Miguel Locks at Night: Effects Like This Form a Striking Feature in a Night Voyage across the Isthmus

8499 *m*
POSING FOR A PICTURE AT
TOP OF LOFTY SPIRE

Standing with outstretched arms on the ball of a weather vane surmounting a high steeple, was the position selected by a daring steeple jack when asked to pose for his picture. He was at work repairing the tower of the Old South Meeting House in Boston, and the photographer would have been satisfied with a picture showing him at work on the swinging scaffold. This did not seem interesting enough to the steeple jack, so he climbed to the top and took the pose shown.



8499 *m*
An Oregon forest ranger, notified of a forest fire, drove to town, hired 10 men and transported them to the scene of the fire, 12 miles away, all in 48 minutes, thus preventing a serious blaze.



ELECTRICAL SIGNAL POST SUMMONS POLICEMAN

The use of a signal post for calling the patrolman to the telephone for communication with

headquarters is an experiment now being tried in New York City. The post is placed at the street corner so that it can be seen down each of the intersecting streets. It is equipped with an electric light having five lenses, one lens being directed along each of the streets and one toward the pavement under the post. In case headquarters wishes to communicate with a patrolman, the light is turned on by means of a connection on the switchboard at headquarters, and is practically certain to be seen by the patrol-

man as he crosses any one of the intersecting streets in walking his beat. The lamp is so arranged that it is visible by day as well as by night. The signal post is provided with a telephone and also with a "citizen's push button," with which anyone needing a policeman can turn on the light and summon one to his aid.

8675 VARIATION OF THE COMPASS OVER HUDSON BAY ROUTE

One of the difficult and dangerous features of navigating the new Hudson Bay route is the variation of the magnetic compass on Hudson Bay and out through Hudson Strait and Davis Strait to the Atlantic. On the west shore of Hudson Bay the compass points 10° east of true north, while through the greater part of Hudson Strait it points

from 50° to 55° west of true north. This is due to the fact that the magnetic pole is not the same as the true north pole of the earth, but is located on Boothia Peninsula only a few hundred miles north of Hudson Bay. To overcome the dangers to navigation from this cause, the Canadian government, after a thorough magnetic survey of the route, prepared a chart showing the exact variation of the compass at each point on the route. Since the preparation of this chart there has not been a single mishap, although in 1913 there were several shipwrecks attributed to uncertainties in the compass. As a further aid to navigation, the government has established ten lighthouses which burn eight months day and night without attention, thus doing away with the necessity for an attendant. These lighthouses are supplied with gas and lighted early in the spring, and continue to burn until the close of navigation.

NEW HOLDER WITH SPRING CLAMP

A convenience adapted to the home as well as the shop is a new spring holder for umbrellas, brooms, tools, and other articles. The holder is fixed to the wall by a gimlet - pointed screw and has two spring jaws which clamp down on any ordinary handle and hold it securely. It is also provided with several small loops for holding such objects as toothbrushes, button hooks, scissors, and gimlets.



All the British aeroplanes now operating on the European battle fields flew to the scene of action under their own power.

Douglas Mfg. Co.,
1230 Fulton St.,
Brooklyn, N.Y.

W. M. Gladish
33 Waver Ave.
Toronto, Canada

Taken from ads. & Commonwealth Edison Company
Chicago Examiner
1912

	ARTIFICIAL LIGHTING HOURS PER DAY	AFTERNOON AND EVENING				MORNING	
		12:00 NOON	4:00 P.M.	8:00 P.M.	12:00 MIDNIGHT	4:00 A.M.	8:00 A.M. 12:00 NOON
JUNE	2.55	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
JULY	2.60	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
AUGUST	3.15	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
SEPTEMBER	4.00	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
OCTOBER	4.90	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
NOVEMBER	6.18	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
DECEMBER	6.85	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
JANUARY	6.53	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
FEBRUARY	5.38	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
MARCH	4.10	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
APRIL	3.48	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT
MAY	2.95	DAYLIGHT	DAYLIGHT	DAYLIGHT	SLEEP	SLEEP	DAYLIGHT

This Diagram Shows the Number of Hours Artificial Light is Used During the Different Months of the Year

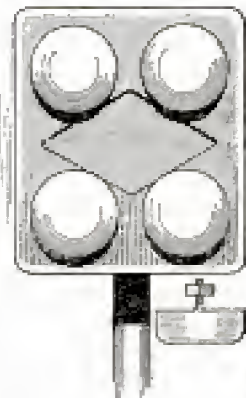
LIGHTING BILLS IN WINTER TRIPLE THOSE OF SUMMER

During the winter months people depend upon artificial illumination nearly three times as many hours in each 24, as in the summer. In June, for instance, electric lights, or other mediums of illumination, are used in the average household approximately $2\frac{1}{2}$ hours a day, while in December this period is increased to $6\frac{1}{2}$ hours. The accompanying diagram, showing how the hours of daylight vary throughout the year, explains why lighting bills for the average residence are practically triple in the winter what they are in midsummer.

stated that the cost of production has been reduced to approximately \$25 a ton, which is very much less than it costs to produce it as a by-product. The world's consumption of ammonia sulphate for fertilizing purposes amounts to hundreds of thousands of tons annually.

PADS KEEP FEET FROM SLIPPING OFF PEDALS

In an attempt to overcome the danger of the chauffeur's feet slipping from the clutch or brake pedals of an automobile, which in a tight corner might prove disastrous, a button pad which fits to the plates and secures a firm hold for the feet, has been made. After the pedals have been in use for some time they often wear smooth. This makes it difficult, especially on bad roads where there are bumps, to keep the feet in position. To fit the pads to the plates, it is only necessary to have a small hole bored. The buttons then may be fastened by bolting.



GAS INDUSTRY OF ENGLAND AND SYNTHETIC AMMONIA

Commercial chemists in England have perfected a method for the synthetic production of ammonia from its elements nitrogen and hydrogen, which, it is stated, is less expensive than the making of sulphate of ammonia as a by-product of the gas industry. In the past year the British price of sulphate of ammonia has dropped 20 per cent, which establishes the lowest value for the salt that has been placed upon it in 10 years. While definite figures are not given out, it is

London Times (Engineering Supplement) July 31, 1914

The Car April 8, 1914

Brown Bros Ltd. Great Eastern St. 15 Newmarket St. Oxford St., W. London, E.C.

NOVEL AND PRACTICAL THINGS FOR DAILY USE



Sandwich Tray Fastens
to Saucer

being made which fastens securely to the edge of a teacup saucer. It is designed in silver in the form of a lily leaf and on its under side is provided with a clasp which fits over the rim of any saucer, enabling wafers or sandwiches to be held with a cup of tea in one hand.



Laundry Bag and
Convenient Fixture

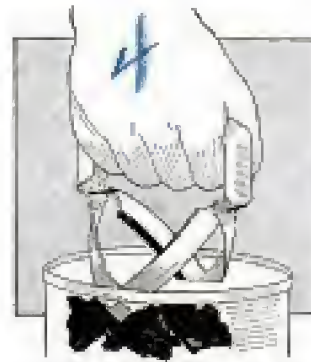
A household laundry bag is being made which is supplied with a metal fixture that holds it open so that soiled linen may be dropped into it without difficulty. The bag itself is of the ordinary type, while the hanger, which is intended to be attached to a wall, consists of a hoop-shaped wire rod open at the middle so that it may be inserted through the draw-string hem of the bag.



Crown-Cap Stopper for
Bottles

Capable of being used for an indefinite time, and attached or detached without means of a separate opener, a crown cap for bottles has been invented which seals a flask air-tight when it is in place. A small thumb lever grips the two ends of a wire which is looped around the

base of the cap. When this is turned down it draws the wire together in a groove about the neck of the bottle and fastens the cap in place.



Downward Pressure
Cuts Can

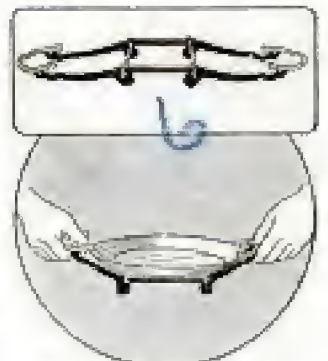
The device is made of heavy steel and has a handle large enough to be gripped firmly. Adjustment is unnecessary when it is being used on different-sized cans.



Simple Holder for Broom
or Mop

its open jaws and holds it securely. The two prongs extend out sufficiently far to accommodate also a dust pan and brush.

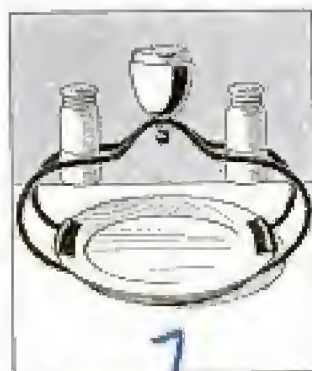
Adjustable holders for dishes are being made which are intended to be used when highly heated china is placed on a table. They afford handles by which



Adjustable Holder for
Hot Dishes

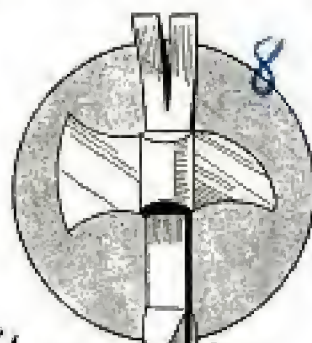
hot dishes may be held without danger of burning the fingers, and also side standards which protect the polished top of a table from being injured by heat.

An individual breakfast service that has recently been shown consists of a metal frame, carrying an egg cup and salt and pepper shakers, which clamps to a plate. Hot toast or biscuits are served on the latter. When it is not in use the frame may be removed from a plate quickly.



Individual Breakfast Service

Designed for opening boxes and crates, a combination tool has been invented which also serves as a hammer, hatchet, box chisel, and nail puller, as well as a cutter for paper and fiber cases. The instrument is substantially made and has a long handle which gives it good leverage in prying.



Box Opener and Combination Tool



Match Box Serves as Wall Fixture

Matchbox, when unfolded, forms a receptacle that may be hung in some convenient position to replace the customary wall match box which requires frequent refilling. The top end of the box pulls out so that it may be suspended from a hook, while the bottom unfolds to form a bin into which the

matches are fed by gravity.

A nutcracker designed for table use is being made which may be used for either large or small nuts. The handles are gracefully curved in such a way that they are easily gripped, while the broad cups in which the nuts are placed, crack a shell over its entire length.



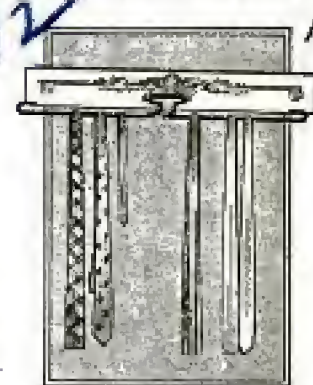
Ornamental Nutcracker for Table

An electric toaster which by a simple operation may be converted into a small stove and used for numerous purposes, either on the table or in the sick room, has been designed. The coils are held in a frame which is so pivoted to the standard that it may be turned vertically and used for toasting, or horizontally to form a flat heating surface on which dishes may be kept warm, tea or coffee made, or water boiled.



Electric Toaster and Stovette

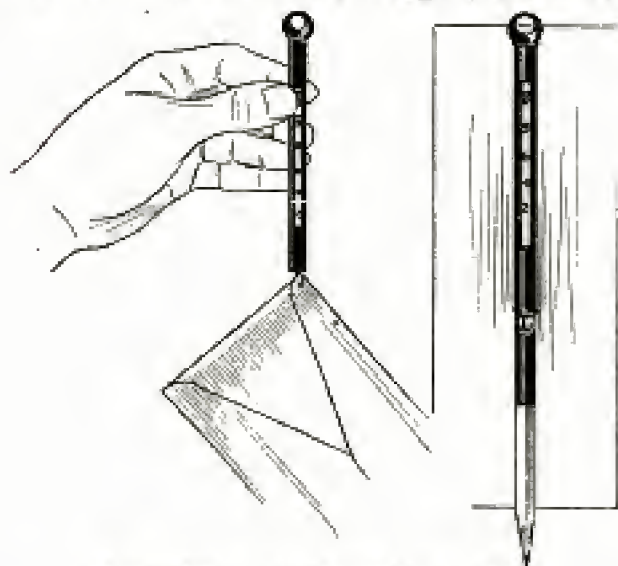
Made of polished wood and burnished brass, an open-armed necktie rack which is both serviceable and slightly has been introduced. The rod on which the ties are hung is bent V-shaped in the middle where it fastens to a wooden back, but is open at either end. The device is intended to be attached to a wall. Since the bar is divided into two parts, scarfs of different types may be kept separated.



Necktie Rack with Open Arms

PENCIL AND POSTAGE SCALE COMBINED IN ONE

Combined with a lead pencil, a novel postage scale which registers the number of ounces a letter weighs, has been

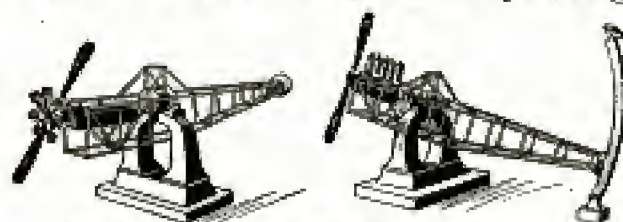


Pencil Fitted with Small Postal Scale

invented. The scale works on a spring which is contained in a small metal tube. At the bottom of this is a hook which may be inserted into the piece of mail to be weighed. The pencil and scale telescope so that the general appearance of the device is the same as that of many pencils. When the scale is not in use the hook is out of the way, being covered by the joining of the two sections.

TESTING STAND FOR MOTORS IN AEROPLANE FACTORY

Ordinarily the stands used in testing aeroplane motors are fixed, and can, therefore, give little authoritative data regarding the behavior of the motor when it is mounted upon the yielding



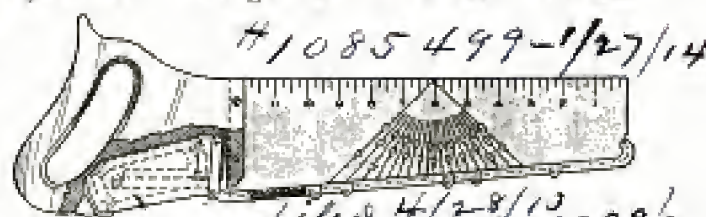
The New Stand Used in Germany for Testing Aeroplane Motors

support afforded by the fuselage, or frame, of the aeroplane. A new testing frame, which has been tried out with

satisfactory results lately, consists of a framework of tubular steel in the shape of an aeroplane fuselage, so pivoted that it permits an up-and-down as well as a limited sidewise motion. A recording device is attached which graphically registers such movements, and from the resulting charts the behavior of the motor is studied. For testing automobile motors the support takes a form similar to a spring-equipped chassis.

NEW SAW HAS SHIELD FOR PROTECTING TEETH

A novel feature in a saw that has just been patented is a shield which protects the teeth when the saw is not in use, but which can be easily folded back into a recess in the handle when the saw is to be used. In addition to this the saw is so made that it comprises a protractor, rule, straightedge and try-square. The shield is of metal and has a longitudinal channel into which the toothed edge of the saw fits, and at the base of the channel is a layer of cork, felt or other soft material, to prevent damage to the teeth. When



This Saw is Equipped with a Folding Shield for Protecting the Teeth, and is So Made That It Comprises a Protractor, Rule, Straightedge, and Try-Square

the saw is to be used, the shield is released by pressure against a spring, and the sections are folded back upon each other and into the recess in the handle. The back of the blade is straight and is perpendicular to the forward edge of the handle, and in this way a try-square and a straightedge of convenient length are provided. Inches are laid off along this edge. The protractor is placed on the side of the blade near the middle, having its center at a V-shaped notch in the back. The zero line is perpendicular to the back and from this line, lines for each 5°, up to

Chas. H. Shapiro,

Portland, Oregon

(Inventor)

Copyrighted material

Berliner Tagblatt
December 18, 1913
Designed by Prof. A. Riedler,
Berlin, & used in the Berlin
Technical High School

45°, are laid out in each direction. Each line is provided with V-shaped openings having their points on the line. With this arrangement two points on a line at any angle are easily laid out and the line is then drawn through the points by using the back of the saw as a straightedge.

ORIENTALS USE RAILROADS AS SLEEPING PLACES

In some of the uncivilized parts of the world which are penetrated by common carriers, railroad tracks are said to be favorite slumbering places for many of the natives. In India women and children who are employed in unloading freight cars are not infrequently seen sleeping on a right of way with their heads resting on the rails, often making it necessary for some one to walk ahead of a train and awaken them in order that it may pass. In certain sections of China a similar condition exists and is responsible for a large percentage of the fatalities caused by railroads there. Upon first seeing a locomotive the natives are usually filled with dread, which later gives way to supreme confidence.

COMBINED CRIB AND SCALE FOR THE BABY

A crib for the baby, combined with a simple scale, permitting constant weighing of the infant without removing it from the crib, is a late French novelty.



The crib is suspended on pivoted cross legs, and the scale is so attached that the weight of the

baby tends to push the legs supporting the crib apart. This is resisted by a rod attached to the dial on one of the lower crosspieces of the crib, the baby's weight being thus instantly registered when it is placed in the crib, the pointer moving over a properly calibrated dial.

La Nature

For sale: Jules Thirfan et
Fils, 110 Boul. Sebastopol,
Paris.

FAN BLOWS HOT SUDS THROUGH CLOTHES

In a new washing machine there are neither gears nor belts. A small electric motor fastened beneath the tub is



Washing Machine Operates on New Principle and
Subjects the Clothing to No Rubbing Process

connected with a fan or propeller within the tub, and the fan sends a constant stream of hot suds through the soiled clothing, contained in a movable cylinder which is slowly revolved by the action of the stream of hot water upon it. The only manual labor involved is that of placing the soiled clothing in the receptacle, and filling the tub with a sufficient quantity of hot water. When the washing is completed, the cylinder is lifted above the level of the water, and the clothing run through an electric wringer attached to the top of the tub.

SAFETY PLATFORMS BUILT FOR SUBWAY TRAINS

The rush and hurry of passengers entering and leaving subway trains makes careful attention essential, especially where some station platforms have been built on curves, and this attention the hurrying passengers often do not give. On the curved stations either the center or the end doors of the cars must be separated by some distance from the platform edge, making a rather long step unavoidable. To obviate this, a sliding platform sec-

Engineering News

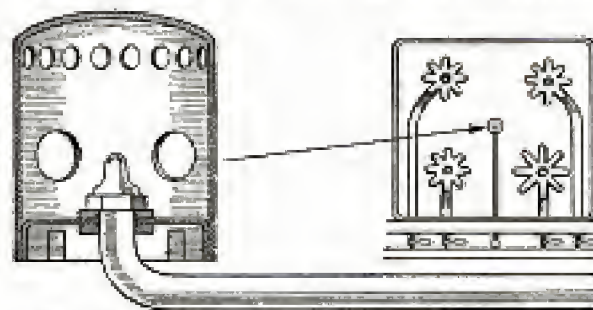
Milwaukee, Wis.

tery, while the small electric bulb, set in the center of the reflector, makes a connection with the carbon post. As soon as this is done, light is produced. The arrangement is convenient, especially for motorists and others who frequently have need for a long-burning light.

IGNITION DEVICE DESIGNED

8338 H FOR GAS RANGES

Eliminating the necessity of using matches, a convenient ignition appliance has been devised for gas ranges which makes it possible to light a burner by pressing a button. This is not an electric device, but a pilot lamp which is attached between the burners of a stove in such a position that, when desired, its flame spreads out over each one of them. It is housed in a venti-



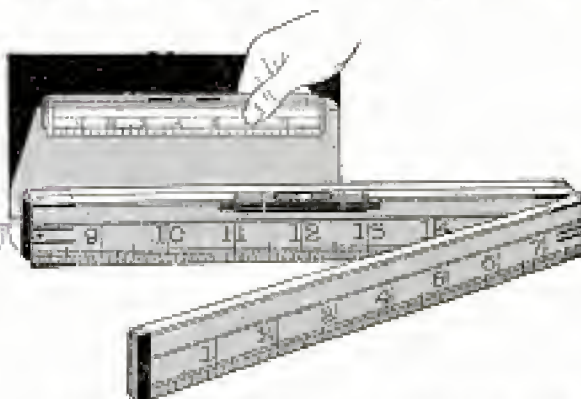
This Lighting Appliance may be Fitted to Any Gas Range in a Few Minutes

lated hood constructed in such a manner that the flame is prevented from being blown out by sudden gusts of wind. At the end of the feed pipe of this auxiliary burner is a button which regulates the flow of gas. When this is pressed down, the flame is increased so that four slender tongues of fire break through holes in the housing and reach the various burners on the range, causing ignition wherever gas is flowing.

SPIRIT LEVEL IS COMBINED WITH POCKET RULE

8267 H A combination folding rule and spirit level is being made which is provided proper alinement and an even bearing surface by specially designed closing pins. The instrument is formed in three 8-in. sections united

by brass joints. The level is depressed in the upper edge of the middle section where it is protected by the two

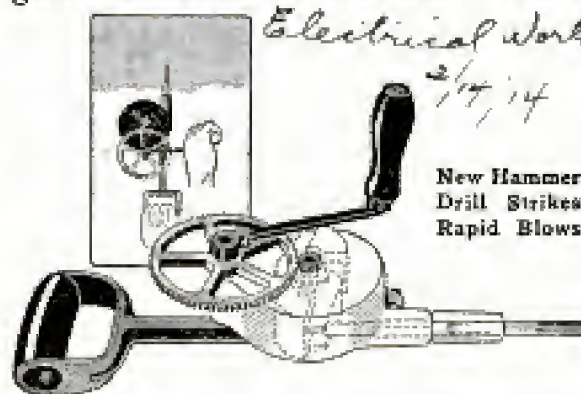


A Combination Tool Which Is Convenient for Both Amateur and Professional Craftsmen

outer sections which inclose it. It offers a convenient tool for many classes of workmen, and is especially serviceable in close places where it is difficult to use the customary level.

MECHANICAL HAMMER DRILL STRIKES RAPID BLOWS

A recent invention for the use of electrical workers and mechanics eliminates the strain and drudgery of drilling by hand, and substitutes centrifugal force for main strength. It consists of a hand drill, operated by a crank, in which revolving hammers, pivoted to a steel spider, strike the head of the drill rapidly. It is so geared that 13 blows are struck to each



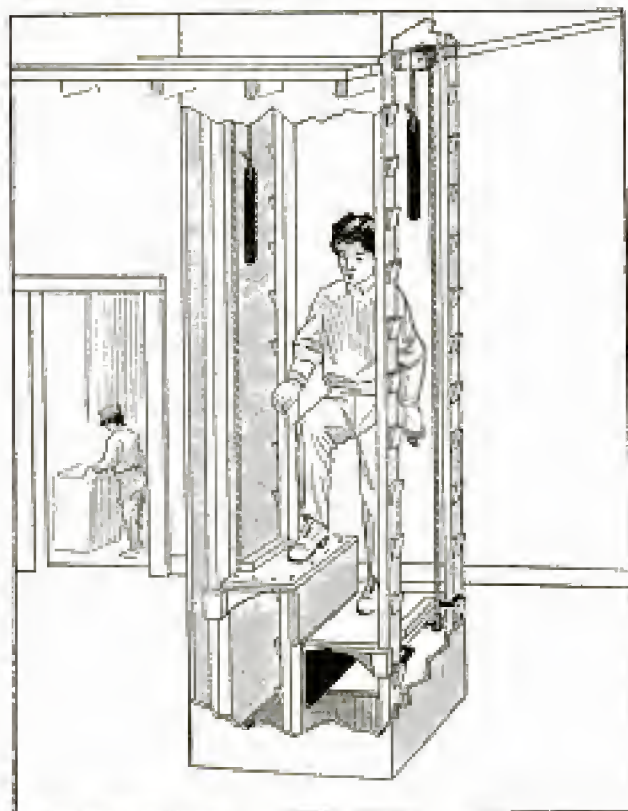
revolution of the handle. For drilling holes in concrete, brick, stone and tile, the new device enables the workmen to more than double their efficiency without fatigue.

Orr & Lockett Hardware Co.,
161 W. Randolph St., Chicago
Broome St., New York

Mfg. & Contributor
The Lufkin Rule Co.,
Saginaw, Mich.

MOVABLE STEPS THAT WORK LIKE ELEVATOR

A novel and ingenious combination of elevator and stairway has been invented for use in places where lack of space prohibits the installation of either



These Steps are Made to Rise or Descend Alternately by Pressure of the Foot

an elevator or a stairway. The apparatus consists of two steps that operate in a small shaft and move up or down alternately under the pressure of the foot. At each corner of the shaft is a post with its outer face provided with spaced teeth, and the front and rear posts are used respectively for supporting the front and rear steps. Each step is provided with a counterweight, and is supported on the posts by means of hinged arms that engage the teeth. In ascending, one stands on one step and allows the other to rise a convenient distance under the action of the counterweight, when the hinged arm engages the teeth in the higher position and holds the step in place. The steps are worked alternately in this fashion until the desired floor is reached. In descending, the steps are released alternately by pressure of the

foot against strips that control the arms, and the steps are forced down to the next lower level. Means for holding the steps stationary at each floor are provided, while ropes suspended from the steps and so arranged as to release the arms from the teeth allow the apparatus to be pulled down readily by a person on a lower floor.

NEW LOCOMOTIVE HAULS RECORD LOAD

What is claimed as the world's record for length and weight of train hauled has just been made by the "Matt H. Shay," the gigantic locomotive recently placed in service on the Erie Railroad and described in the July, 1914, number of this magazine. This locomotive made a run of 23 miles at an average speed of 14 miles an hour, hauling 250 loaded 50-ton gondola cars and a dynamometer car. The total weight of the train, exclusive of the locomotive, was 17,912 tons, while the train was over a mile and a half long. The average drawbar pull for the run was about 100,000 lb., and, in order to avoid pulling the train in two, it was necessary to use pusher engines in starting. Telephones were used for communicating between the front and rear ends of the train.

TABLE SIRUP MADE FROM APPLE JUICE

As the result of a process that has just been developed by the U. S. Department of Agriculture for making table sirup from cider, it is expected that a new and profitable field will be opened to apple growers for disposing of their culls and surplus apples. The raw cider is treated with pure milk of lime to neutralize the natural malic acids. The liquid is then heated, filtered, and evaporated. Another filtering process removes the crystals of calcium malate. One gallon of this sirup is made from about seven gallons of cider. It is of a clear ruby or amber color, and in sealed cans it keeps indefinitely.

Weekly News Letter from
Agricultural Dept.



Homemade Concrete Mixer

By H. B. STRALEY

J. N. X1K16)
23427

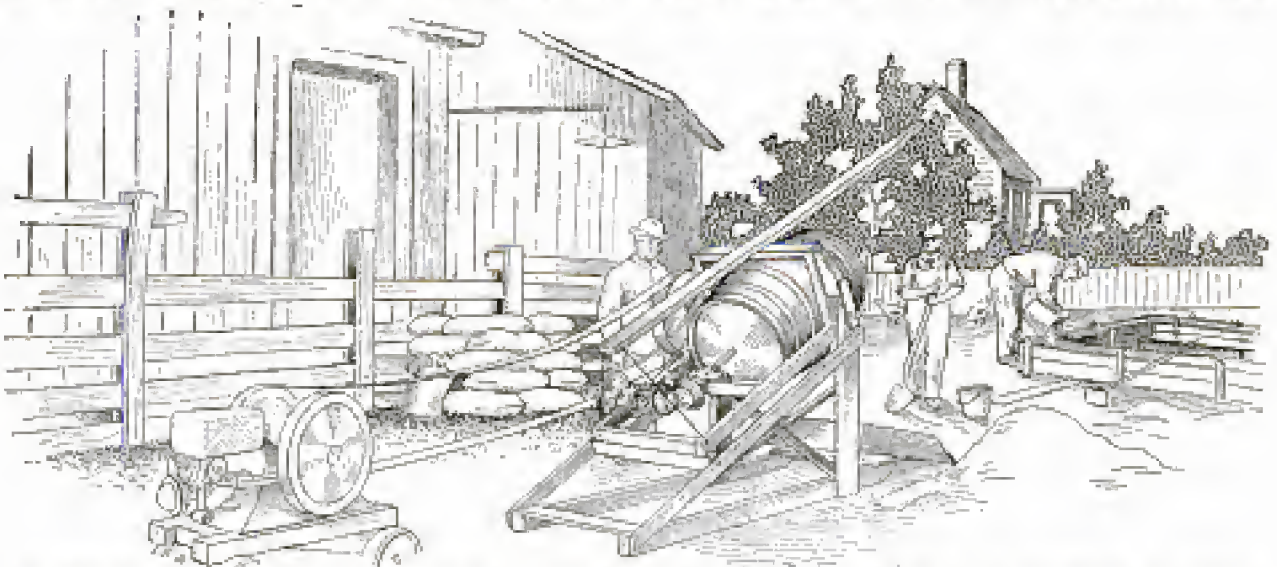
TO mix small portions of concrete for odd jobs with a shovel or a hoe becomes a tedious task, and to have a large mixer would be entirely too expensive for the amount of work required of it. One farmer, with the outlay of only a few dollars, made a small mixer that will do as good work as any power-driven machine, yet it is small and uses very little material for one charge.

An ordinary oil barrel was procured and mounted on a framework of 2 by 4-in. material. A square frame was constructed around the center part of the barrel, which had a steel band without any rough joint fitted on. In the lower corners of this frame two brackets were fastened, each made of two pieces, between which a flat-faced wheel was placed on a shaft run through the pieces. The main portion of the barrel is supported on these wheels, their faces running on the steel band. A little to one side of the center of

this frame two pieces were rigidly attached at right angles so that their ends extended a couple of feet beyond the bottom of the barrel when it was in its place.

Across the diameter of the barrel bottom a piece of metal, or timber, was placed and solidly fastened with bolts. Exactly in the center of the barrel bottom and crosspiece, a hole was bored and a shaft fastened, which was long enough to run through the bearing set in the frame, and to have sufficient end to attach a bevel gear. A cross shaft was provided and supported in a bearing fastened to the extending pieces attached to the square frame.

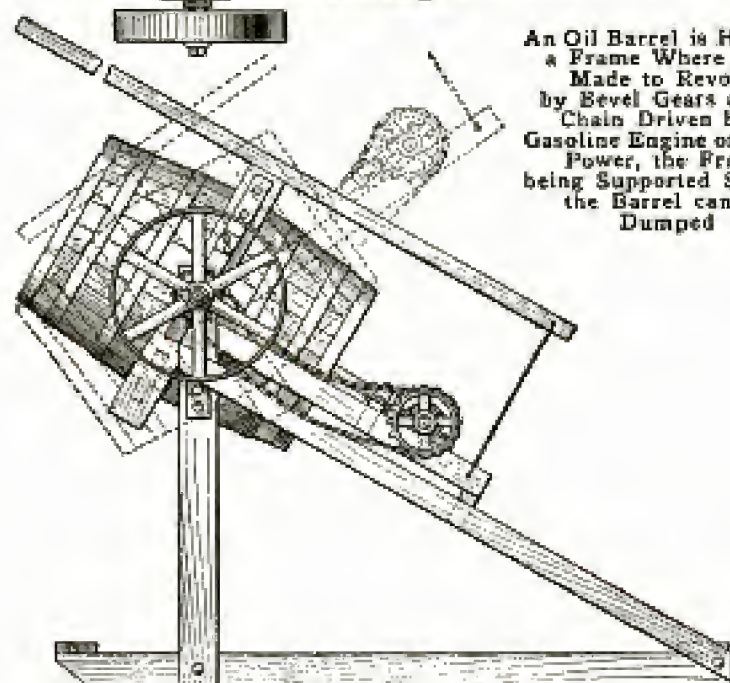
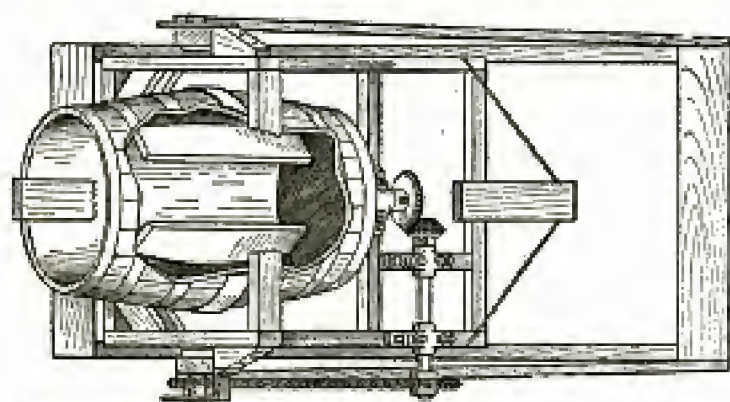
The square frame was mounted on bearings, centrally located in its sides and connected with brackets, as shown, to the upper ends of vertical pieces, braced and connected to pieces sloping toward the rear, forming a triangular framework for the machine. A band wheel and a sprocket wheel were



In Making Silos, Foundations, Feeding Floors, Fence Posts, and the Like, It Is Necessary to Have a Mixer for the Concrete, and the One Shown will Serve the Purpose Where There Is No Large Amount of Work

mounted on one shaft that was attached to the outside surface of one upright. A chain connected the two sprocket wheels.

A long lever, fastened to the cross-piece on the upper part of the square frame and wired to the ends of the



An Oil Barrel is Hung in a Frame Where It is Made to Revolve by Bevel Gears and a Chain Driven by a Gasoline Engine or Other Power, the Frame being Supported So That the Barrel can be Dumped

pieces that extend to the rear of the barrel, provided a means of tilting it, to pour out the contents when the mixture was completed.

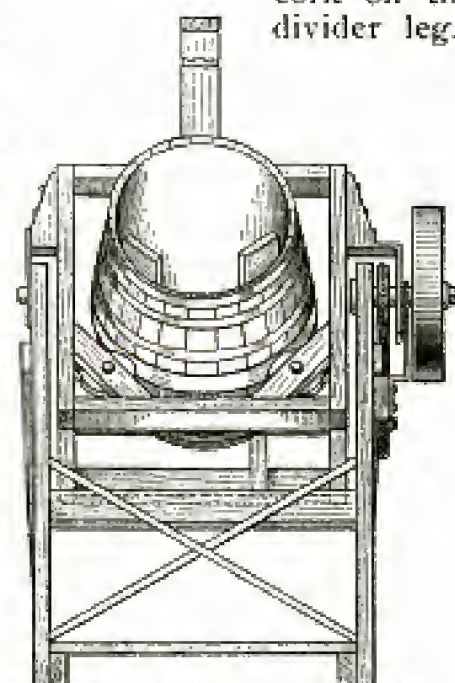
On the inside surface of the barrel several pieces were attached, so that they projected and furnished obstructions to catch and spill the aggregate as the barrel revolved. The machine may be driven from any power with a belt.

CA bag made of soft flannel is best to keep inner tubes in, and the mouth should be tied around the projecting stem.

Dividers Used as a Bow Pen and Pencil

Instead of carrying a complete drawing set about in making sketches, a pair of dividers, a 6-in. scale, and a small cork will answer for all purposes.

In one end of the cork, insert one of the divider points, in the other end cut a small, deep slit. Place a pencil lead in the slit, and use it as a bow pencil. To use as a bow pen, remove the lead and place an ordinary pen in its place. The adjustment up and down can be had by moving the lead or pen point in or out of the cork, or by sliding the cork on the divider leg.



The Use of Waste in an Oil Cup

The general impression that a pad of waste stuffed in an oil cup, or oil recess, will feed out the oil a little at a time and save a lot of attention is absurd, as what oil gets to the bearing will run there in spite of the waste.

In considering the facts, it will be found that in but very few cases does the waste come in contact with the revolving shaft. If it did the shaft would be lubricated as long as that part of the waste was saturated. Suspend the wad of waste above the shaft, and the only oil that will drop is the

excess that filters through by its own weight. The waste may be well saturated, but there is little capillary attraction in the mass, and, contrary to the general idea, it does not act like a wick.

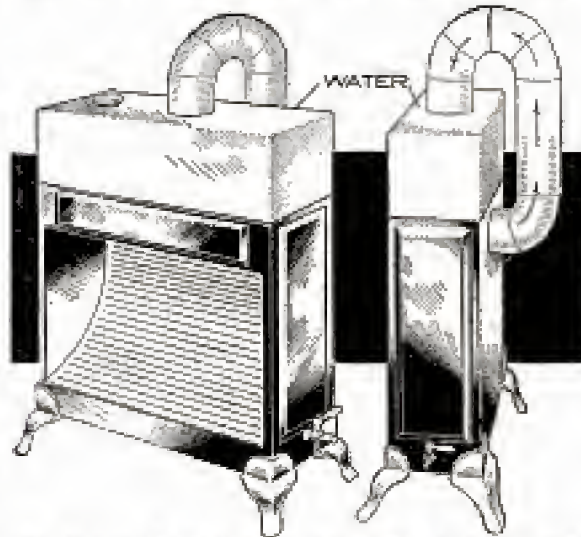
In cases where the bearing does get oil, it is because the waste is sufficiently porous to permit some of the oil to pass through every time any is squirted into the cup. To prove these facts, pour a tablespoonful of oil into an empty ink bottle, and lead a small wick out from it so that the drip will be caught in another vessel. In a couple of hours the bottle will be dry, only a portion of the oil remaining in the wick. Contrast this with the waste. Roll up a ball of the waste, about the size of an ink bottle, saturate it with oil to the same degree as the wick, and suspend it by a wire over a vessel and note the result. A dozen drops will fall in a day's time. Pour on a teaspoonful of oil, and a small percentage of oil drops off. Repeat it, and only a little more falls. If the intervals between the application of oil are long enough and the amount is small, the oil simply dries up in the waste.

Any case in which waste is depended upon to do self-feeding should be carefully investigated. The slow speeds at which the shaft revolves, the loose fits, and the generally oily condition of some machinery on which the waste pad is used, have given credence to its wonderful properties. Liberal quantities of oil will pass through almost any body not solid, but such liberality is not economy. Waste in an oil cellar in contact with a revolving journal will lubricate under the worst of conditions, as is easily shown by the large amount used on car journals, but a wad of it in an oil cup is of no assistance whatever in oiling a bearing.

When riding over sand roads with a motorcycle, let some air out of the tires, especially the front one, which should flatten quite a little. Use just enough pressure to keep the rims from striking the ground.

Eliminating Gas Fumes from a Gas Stove

To eliminate the fumes from a gas stove, make a closed tank, the size of the stove top, and run the pipe into

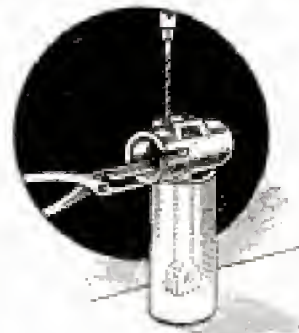


The Fumes of the Gas are Discharged into the Tank of Water on the Stove

it as shown. Fill the tank with water through a hole in the top, which should be provided with a screw-cap cover. With this arrangement, the stove can be taken wherever required, as a chimney is not necessary for a vent.—Contributed by David H. Brook, Dayton, O.

Holding Odd-Shaped Pieces in a Pipe While Drilling Them

In drilling odd-shaped pieces on a drill press, it frequently is necessary to hold them in a vise or some special jig. A piece of suitable-sized pipe can often be used to serve the purpose as well. One end, which should be square with the sides, rests on the drill-press table. The other may be square or suitably cut to fit the irregular piece to be drilled.—Contributed by D. C. Goff, Knoxville, Tenn.



Bookcase for Itinerants

When moving the ordinary bookcase, all books must first be taken out, and moved independently of the case. This

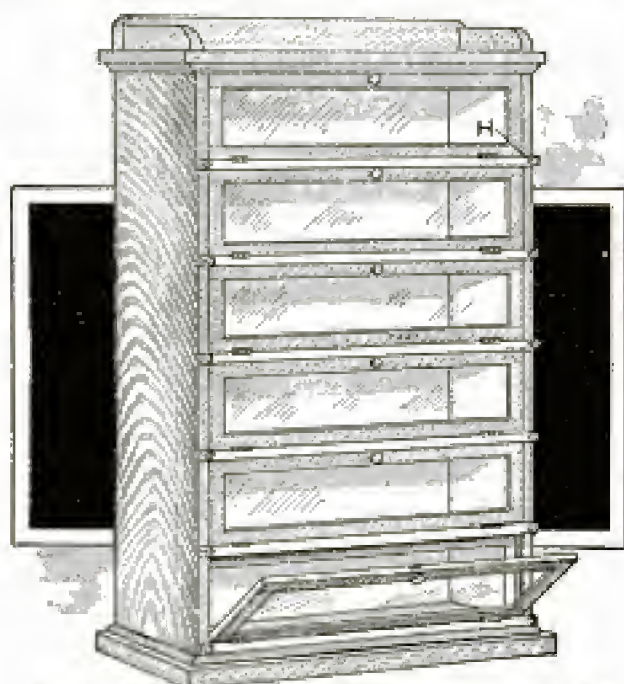


Fig. 1—The Packing Boxes When Assembled Give the Appearance of an Ordinary Sectional Bookcase

not only means much extra work in unpacking, repacking, and final rearranging when destination is reached, but also requires special boxes for the books and a crate for the bookcase—if this is to be shipped from one city to another. The illustration, Fig. 1, shows a new type of case in which the sections form the packing cases for shipment, and Fig. 2 the manner in which they are made up to stack in a case.

The outside frame, made and finished in any suitable manner, consists of four parts: a base, A; top, B, and two sides, C. The various sections for the books consist of open boxes, all of one length. Their height may vary according to the size of books stored in them. Their width must be such that when the doors F, are fastened in place they will come flush with the edges of the sides C. Molding strips, D, are fastened to A, with the two end pieces so located that the section boxes and sides C will fit in between them snugly; the molding

pieces E, on the top B, are likewise so spaced as to hold all parts securely. The glass doors F are made to fit the boxes and completely cover the open side. They are attached by hinges to metal strips, G—or strong wooden molding, if preferred—which are fastened in position to each side by means of thumbscrews H. When opening any particular section, its door is swung down. The bottom and top box should have several strips, K, fastened to the sides facing the bottom A and the top B, corresponding in length to the width of the boxes, and of such a thickness that the edges of those boxes come in line with the edge of the molding. In this way, the top and bottom doors may be fastened like the rest. If the top and bottom boards are of sufficient thickness, they may be mortised to receive the sides C, in which case it would not be necessary to use the molding strips E and D, nor the lining-up strips K.

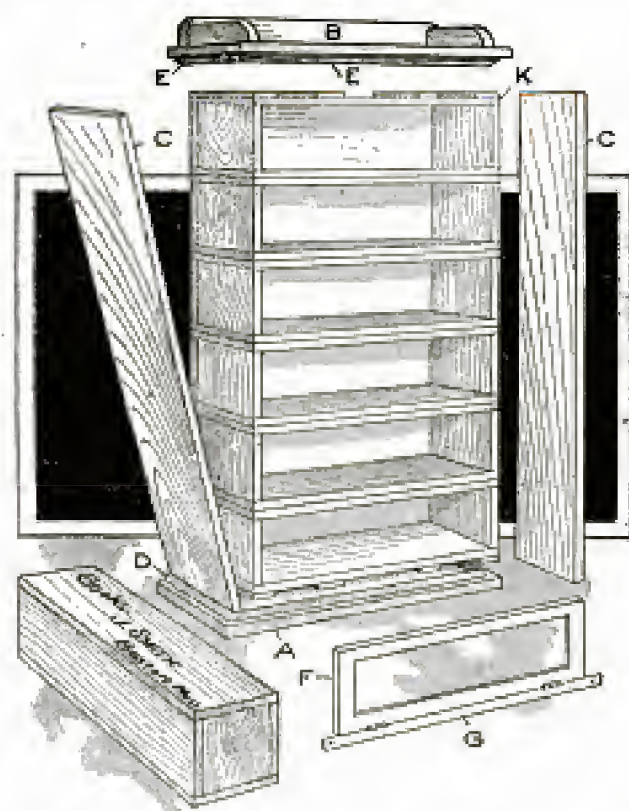


Fig. 2—Case in Sections Ready for Assembling, and a Section Box Closed Ready for Shipment

When necessary to move the case, the doors should first be unscrewed, and then the sides C and top B taken

off. Each box section, with books in it, is then taken off and closed up with an ordinary board cover, after which it is ready to be shipped. The case and doors may be put up in a convenient bundle, or crated. On arriving at the destination, the covers can be readily removed from the boxes and the case assembled as already described. The books being in place, much time and labor is thus saved.—Contributed by E. H. Witman, Danville, Pa.

Protecting the Bed Hammock

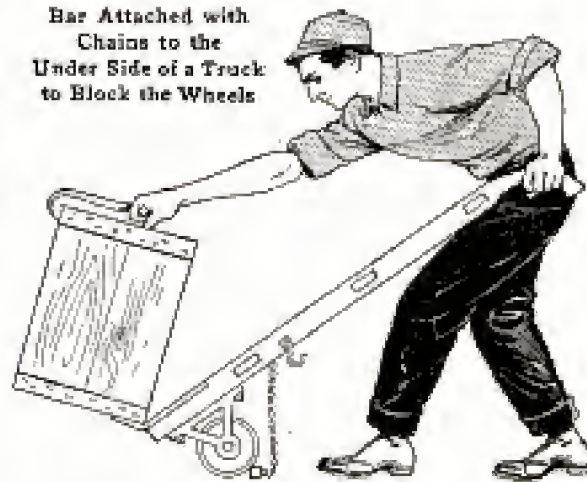
Owing to the size and weight of a bed hammock it is generally left outside in all kinds of weather. A good plan is to fasten two awning pulleys to the ceiling of the porch over the hammock so that a rope may be run through them, then attach hooks to the ends of the rope for hooking into the lower part of the hammock. The hammock can then be pulled up close to the ceiling, when not in use, so that it will be out of the sun and rain.

Blocking Attachment for a Shop Truck

In loading heavy pieces on the bed of a common shop truck, it is often necessary to block the wheels to prevent them from rolling back on the floor and spilling or tipping the load as the weight is raised by the front of the truck. I have seen quite a few accidents occur while workmen were attempting to swing the load on the truck without properly blocking the truck wheels. This is often foolishly attempted when there happens to be nothing immediately at hand suitable for use as a block. The sketch shows an arrangement which can be attached to the truck. Just before tipping the truck the blocking piece, or bar, can be kicked out of its hooks with the foot and replaced quickly, when the load is swung up and balanced on the truck. With this arrangement attached, there is no need to look around for a block. The piece of iron with its

chains is so light and so located that it will not interfere with the use of the truck. As a safety device it is hard

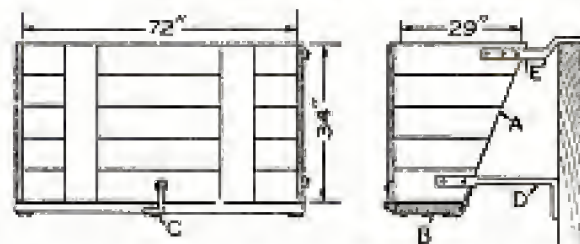
Bar Attached with Chains to the Under Side of a Truck to Block the Wheels



to beat, and will prevent a number of accidents to workmen handling heavy material.—Contributed by F. W. Bentley, Jr., Missouri Valley, Iowa.

Hopper for Measuring Sand Unloaded from Freight Cars

In unloading sand from gondola cars into wagons, it was necessary not only to measure the amount in cubic yards accurately, but also to avoid spilling the sand on the ground. The arrangement shown in the sketch successfully overcame the difficulties. It consists of a hopper, A, of 1-cu.-yd. capacity, with a hinged bottom, B, held shut by means of a catch, C, fastened to the side. Wrought-iron braces, D and E, attach it to the side of the car so it can be slid along as the unloading advances. The hauling wagons can be



The Hopper is Hooked onto the Side of the Car Where It is Loaded with Shovels

driven under the hopper, and the known amount dumped entirely into them.

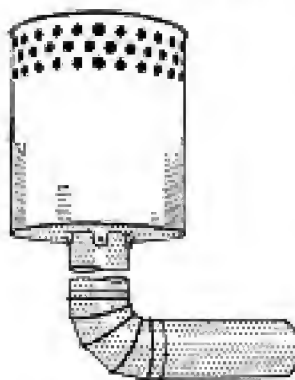
Fastening Molding to Automobile Doors

The usual method of attaching a molding on an automobile door is to drill holes and put in screws from the top. A better method is to rabbet the door top as well as the molding so they fit together, and fasten with round-head screws from the inside. Plates can be formed and fastened on either side, with their upper portions bent and placed under the molding, as shown. With this method no screw heads will show on top of the door molding.—Contributed by Frank P. Reidhaar, Connersville, Ind.



To Prevent Down Draft in Chimneys

Procure a 5-gal. can and perforate the sides near the bottom with holes, $\frac{1}{2}$ in. in diameter. The can is then set over the end of the chimney pipe and fastened with brackets. The chimney pipe should extend into the can a short distance. The holes will let out the burnt gases, but a sudden gust of wind will not affect it in the least.—Contributed by P. D. Merrill, Saugatuck, Michigan.



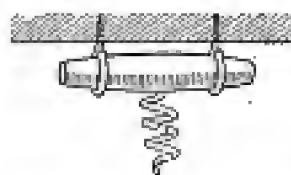
Roach Makes Ground in a Telephone Relay

Being sent out recently by the wire chief to clear up a line which was grounded, I finally located the trouble in the instrument, and when I told the chief the cause he would at first not believe it. A roach had wedged itself

between the frame and the magnet of the relay, thus causing a contact between the springs. The telephone being one of the four-party type, it easily caused a ground.—Contributed by C. W. Elliott, Toronto, Can.

Liquid Spattering Avoided with Fixed Corkscrew

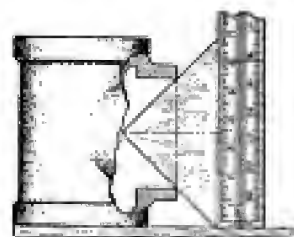
When it is necessary to remove a cork from a bottle it frequently occurs that the corkscrew has been misplaced, and when found and used in the usual manner, part of the contents are often spattered over one's clothing. To



avoid these troubles, the corkscrew can be attached to a wall, or shelf, in a convenient place, where it can always be found when needed. In using it, the bottle is screwed onto the puller and gripped with both hands to remove the cork, thereby providing not only a better grip, but also avoiding the otherwise necessary position in line with the contents as they flow or spatter out of the bottle.—Contributed by L. E. Turner, New York, N. Y.

Locating Centers of Pipe Fittings

To locate the center of pipe fittings, such as elbows, tees, and crosses, I made a tool in the shape of a triangle to use in connection with an ordinary pocket rule. The fitting is placed on a bench, or board, and the triangle inserted in the opening of the tee. The rule is then placed against the edge of the triangle. The center line on the triangle gives the dimension wanted. The material required to make the device is a piece of board, $\frac{3}{4}$ in. thick.—Contributed by A. L. Kerbaugh, Allentown, Pa.

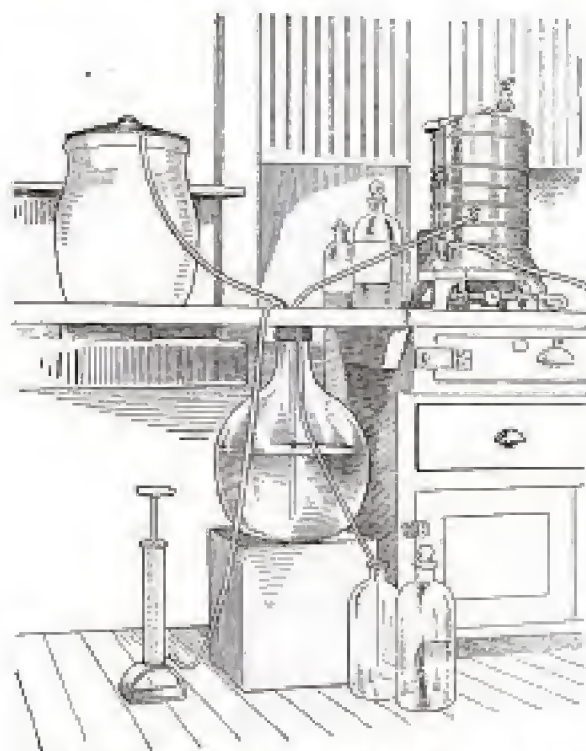


The Making of Distilled Water for Laboratories

By W. M. MILLS

IT is so necessary to have plenty of distilled water on hand in large laboratories, or in buildings where chemical or technical investigations are carried on, that it is imperative to have an arrangement that will give satisfaction along this line. The illustrations show two installations. In the first, distilled water is the main thing sought, and in the second it comes as a by-product from the steam coils of the building or steam otherwise condensed.

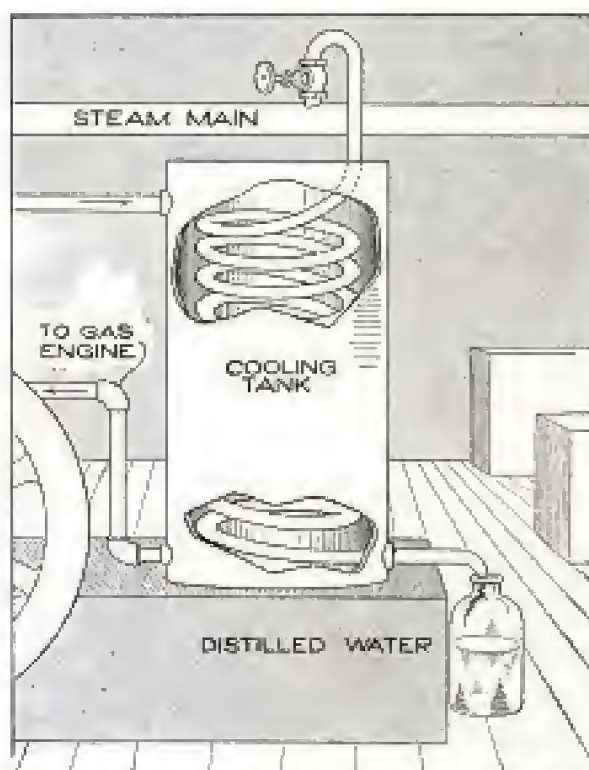
In the first sketch the water is distilled from an ordinary laboratory still, thence it is conveyed to a carboy below, from which the water, being protected from dust by a cotton filter, is again drained off through pipes into 1-gal. bottles, as needed. For use in a laboratory where it is made, it is forced from the carboy to the covered jar above by a force pump attached to a tube below. A pipe is fitted from the



The Arrangement of a Still and Carboy to Produce Distilled Water Free from Contaminations

carboy to the jar above and the water passes up easily till the jar is filled, which is enough to last a large class

in analysis for a few days. The bottles filled from below are for other



Distilled Water can be Produced from a Steam Main with a Connection and Coil in a Tank

classes in other laboratories about the buildings.

The second method of preparing distilled water is by the condensation of live steam through a copper coil attached to one of the mains of the plant in the building. A hole of the proper size is drilled through the upper side of the main, or if that is impracticable, well up on the side of the main, in order that when the steam or water issues from it there will be no sediment carried with it to contaminate the water. Thread the hole and connect a pipe to it by a threaded connection and globe valve. Lead the copper pipe downward through a water jacket, such as shown in the illustration—in this case the cooling tank of a small gasoline engine. After making several coils in the tank, it is led out through a waste nut fitted at the bottom, and the end is turned down so that 1-gal. bottles can be set under it. After run-

ning some time the valve can be so adjusted that the live steam will all be condensed. This apparatus is well adapted for all northern states where steam is employed in heating, while the first one is best adapted for the southern states.

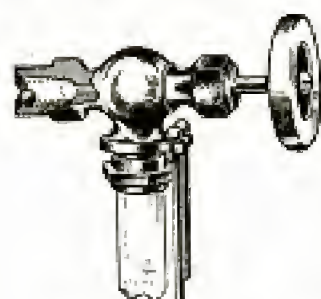
Flat-Bottom Fire Bucket Fitted with Curved Base

When ordinary flat-bottomed pails are set aside to be used in case of fire only, they are frequently taken—as they are usually found in convenient places—and employed for other uses. If an iron strap be riveted to opposite sides of the pail with the center portion forming an arc, it cannot, without difficulty, be set up straight, and consequently is spoiled for other purposes than fire.—Contributed by George Jaques, Chicago, Ill.



Automatic Valve for Water-Glass Fittings

To make a safety water-glass fitting, provide a ball valve for the valve part that attaches to the boiler, as shown.



If the valve end has a very small hole, ream this out tapering, so that a cavity will be made for a steel ball. The large end of the opening is then fitted with a disk, to keep the ball in place. The holes in the disk and into the valve part should be somewhat smaller than the diameter of the ball.

In action, when the gauge glass

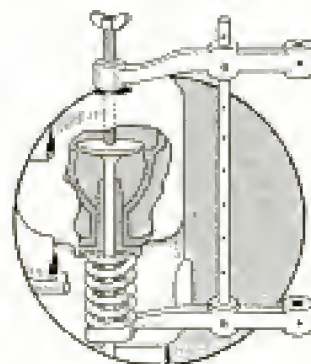
breaks, the force of the steam or water will drive the ball into the conical-shaped seat, made by reaming the hole tapering. This will close the hole and prevent the steam, or hot water, from escaping until the valves can be closed. The ball will then drop back into the cavity and allow the steam and water pressure to balance each other in the new glass gauge when it is in place.

Fastening for Rope Ends of Extension Ladders

Painters, and others, using rope extension ladders can very easily save themselves the annoyance of having the end of the extra rope underfoot, as follows: Tie the free end of the rope to the bottom rung of the top section, so that, when it is extended, it will take up the slack automatically, thus doing away with the bother of having it underfoot.—Contributed by C. H. Lockwood, Masonville, N. Y.

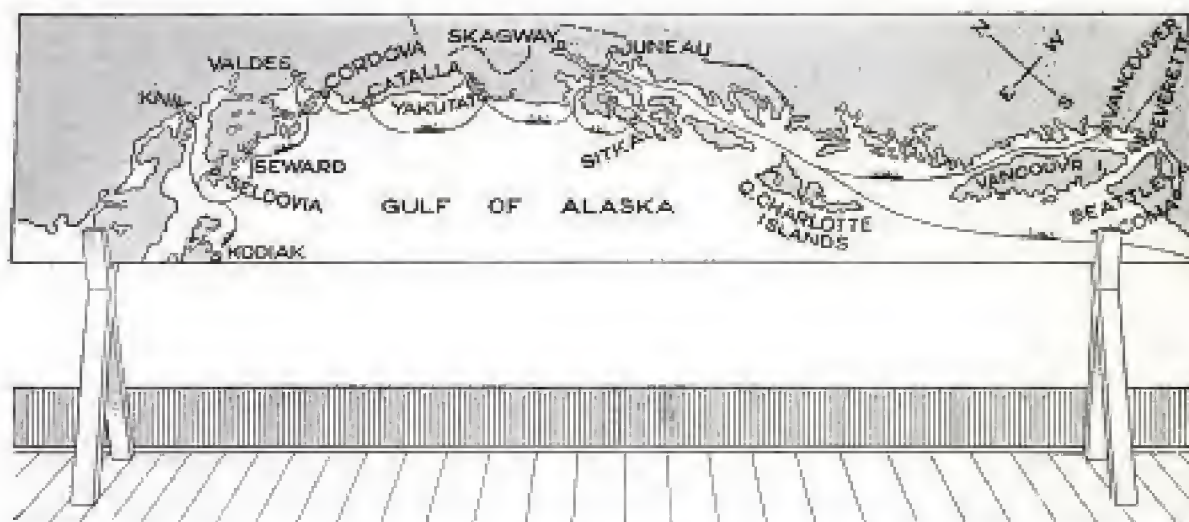
Valve-Lifting Tool for Automobile Engines

The simple device illustrated is one that a repairman should have in his kit of tools, or an automobile owner in his tool box.



It compresses the spring so that the washer and key can be easily removed or put in place. It is simple to make and consists of two arms joined together with a rod made

adjustable by drilling a number of holes through its diameter. The arms can be forged and swaged to suit the maker. One arm has a fork on its end to fit over the valve stem under the spring, and the end of the other arm has a tapped hole to receive a wing-head screw. Its application is obvious.



Model Boats are Set in Grooves on the Chart and Placed Each Day According to Wireless So That a Glance will Tell the Movements of All Vessels Entering One Port

Steamship Chart for a Hotel Lobby

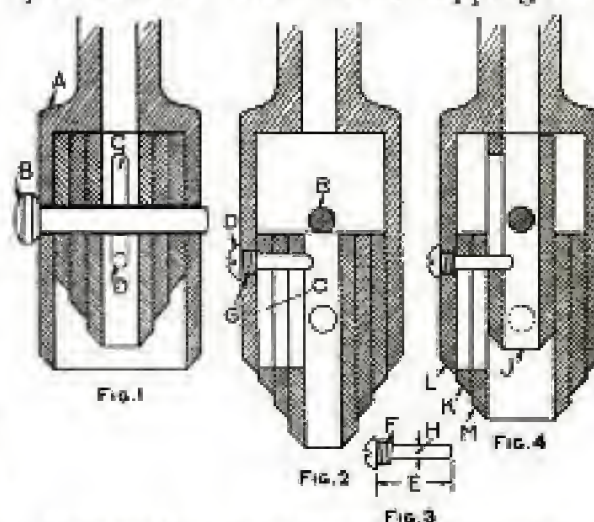
As there is always great interest in the shipping in and out of a port in Alaska, I had a frame made, 8 ft. long and 20 in. wide, of material 2 in. square. The frame was then covered with galvanized iron with a small tin groove soldered on it in the channel to hold pieces of wood shaped like boats. The chart was then colored, and the boats were painted in the colors of their respective lines operating in the port. The name of each boat was written on paper with a typewriter and the paper pasted to the boat's bow.

The position of each boat is changed on the chart every day, according to wireless advice received on their location from the time they leave Seattle until they return.—Contributed by Harry F. Cain, Juneau, Alaska.

Multiple-Size Punch

The illustrations show a punch for cutting four different-size holes. The general idea of the tool can be applied for a greater or less number of cutters, as desired and practical. The largest diameter of cutter becomes at the same time the body, or holder, A, Fig. 1. It is bored out to a size slightly larger than the outside diameter of the second largest punch, which, in turn, is

bored out slightly larger than the next size, and so on, down to the last, which is drilled to the size of punch diameter required. The body A is drilled for a pin, B, at such a distance from the cutting edge as to cause the remaining cutters, when resting on B, to assume the positions shown in Fig. 2, each projecting out a little farther than the next larger size. In this way each cutter is held rigidly in place, being braced by those of larger size, and the thrust comes on the pin B. To prevent the cutters from slipping out



Three Positions of Punch for Using the Largest, Smallest, and Second Cutters, Respectively

when in their extreme position, they are provided with a long slot, C, through which passes a pin, D, securely held in one position in the body

A. This pin, Fig. 3, is of sufficient length, E, to pass through all the cutters on one side. The pin is threaded at the end F, to fit a correspondingly threaded hole, G, in the holder A. The body of the pin is of a diameter, H, slightly smaller than the width of slot in the cutters.

Whenever it is desired to use the largest punch, the pin B is withdrawn, allowing the cutters to drop to the bottom of the holder. In this position, each cutter—having been drilled with a hole slightly larger than pin B—is held in place by putting the pin through the holes. If the smallest cutter is to be used, all the cutters should be put in their extreme outer position, and the pin B put in place as in Fig. 2, the desired cutter being

thereby braced and held on all sides. Supposing it is required to use the second smallest punch, it is necessary to allow the smallest cutter to drop into the holder, after which the pin B is replaced, holding all cutters in the set position. This is shown in Fig. 4, the second cutter M being drawn out, leaving the smallest J in the holder, and the larger cutters K and L supporting the second. Any other combination—within the limits of the tool—can be made, first allowing all cutters larger than the required size to come out in cutting position with the desired cutter; all smaller cutters must remain in the holder. The hole in the body A is for inserting a rod for removing the punching scraps.—Contributed by John Harger, Honolulu, H. I.

A Hand-Power Bench Shaper

By J. B. MURPHY

There is no tool that can take the place of a shaper for certain kinds of work, but the owner of a home workshop usually cannot afford a machine of this kind, so that when it is necessary to do this class of work, it takes hours of time to obtain the results with a file. To provide a tool that can be worked by hand power and take the place of an expensive machine, the one illustrated was designed and most of the parts made of white oak.

The shaper is built on the workbench, where it is attached by means of the bolts A. The general dimensions are omitted, as the machine can be made in length and width to suit the class of work required of it. The lever B—made of hickory, 24 in. long and 2 in. thick—for operating the ram C, is tapering and slotted for the driving stud D.

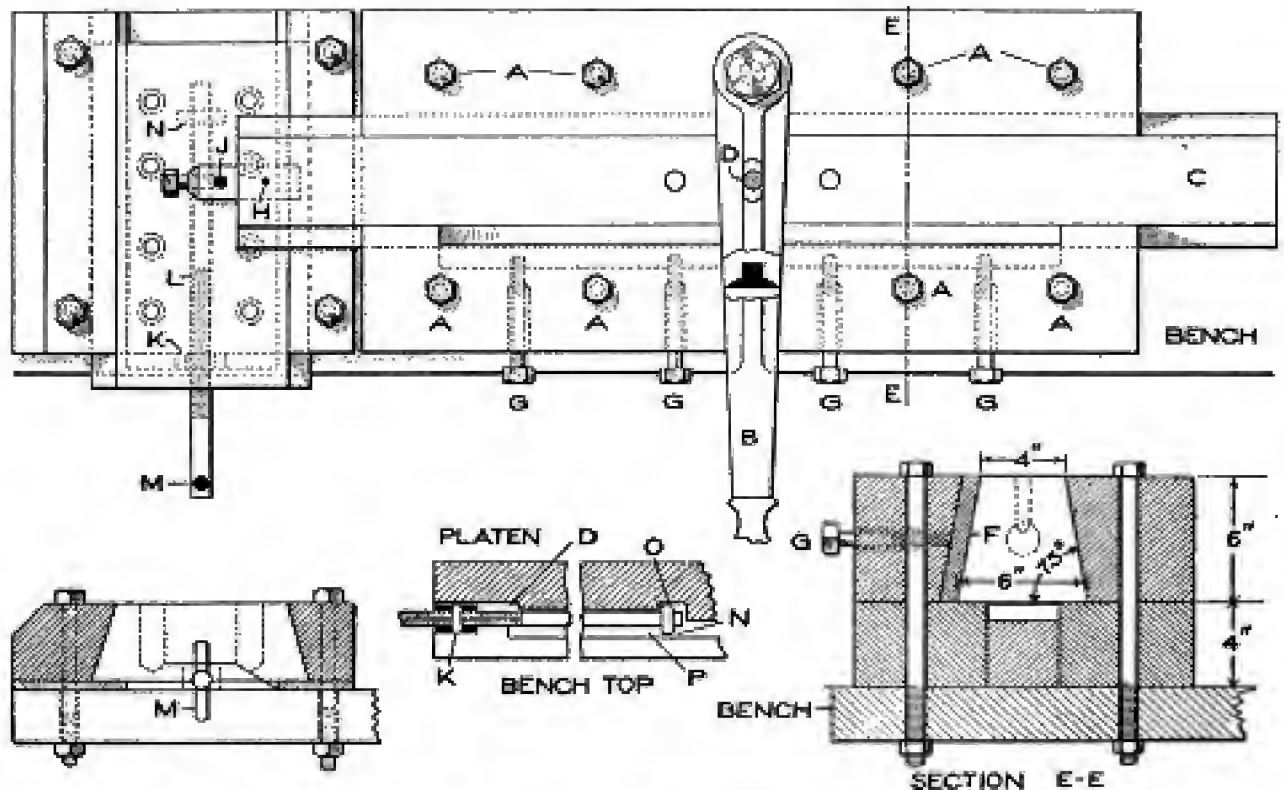
The ram C is made of a piece of oak, 6 in. square and 40 in. long, and is beveled, as shown in the cross section EE. Adjustment for wear is made by the piece F, which is controlled by the screws G, tapped directly through the wood gib. The ram moves upon a three-piece bed, the center piece being

a little smaller than the two outer pieces that form the ways. This gives the ram proper clearance and avoids unnecessary friction.

In the front, or working, end of the ram, a piece of heavy $1\frac{1}{2}$ -in. tubing is driven into a hole bored in the end of the wood, and a pin H is inserted in a hole drilled through both ram and tubing to prevent the latter from turning. In the outer end of the tubing and close to the end of the ram, a $\frac{1}{2}$ -in. hole is drilled for the tool J. The tubing tool post is located centrally in the end of the ram, as shown in the cross-section sketch.

The tool can be made of a discarded round file, ground properly and tempered to cut metal. One side of the file is ground flat to make a seat for the setscrew. The setscrew is fitted to the end of the tubing by locating it centrally and pouring babbitt metal around it. A large or coarse thread is necessary, and its bearing should be about 2 in. long.

In the detail of the cross feed, the nut K is recessed in the under side of the platen. The bolt L is turned by hand with the pin M. The bolt, when turned



Details Showing Well-Proportioned Parts of a Shaper That will Produce as Good a Grade of Work as an Expensive Machine, Most of Its Parts Being Made of Hard Wood

in or out through the fixed nut K, causes the head N to draw the platen either way as the cut is taken. The head N fits into a recess, O, cut in the under side of the platen. A clearance groove, P, is cut in the bench top for the lower part of the bolt head as it travels from end to end.

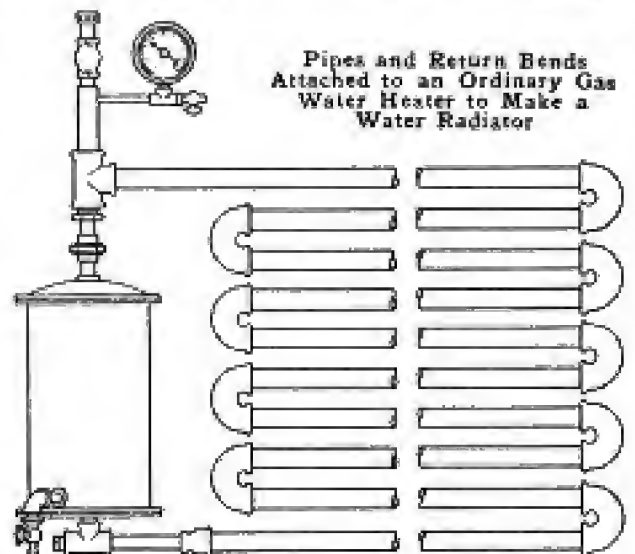
A good lubricant for the surfaces that slide together is oil and graphite. A cut, $\frac{1}{16}$ in. deep, can be taken with a feed of $\frac{1}{16}$ in. All light planing for experimental work can be done with this planer.

A Gas Water Radiator

The illustration shows a gas water radiator that I constructed from pipe and fittings, using an ordinary gas water heater. Enough $1\frac{1}{4}$ -in. pipe and return bends were used to give about 25 sq. ft. of radiation. The manner of connecting the pipe to the heater is clearly shown. The upright pipe accommodates the rise of the water level due to expansion. A safety valve is placed at the upper end of this pipe.

A small pressure gauge is shown,

but this is not necessary. A pressure of from 1 to 5 lb. makes the radiator much more effective, especially in cold weather. This heater was intended to be used for chilly weather in the spring and fall, but it has been in use every day and night during the entire winter, and keeps an ordinary-sized dining



room at a very comfortable temperature with a very small consumption of gas.—Contributed by Claude Swaim, Indianapolis, Ind.

Determining Generator Efficiency by Stray-Power Method

By A. E. ANDREWS

ALL the losses in a direct-current generator or motor may be grouped under one of two main heads, namely, electrical losses and stray-power losses. The electrical losses (I^2R) include all losses in armature winding, commutator segments, brush resistance, resistance of leads to terminals of the machine, and the series and shunt-field windings. The stray-power losses include all friction losses, such as bearing and brush friction, windage, which is the loss due to the fan action of the revolving portion of the machine, and the hysteresis and eddy-current losses, which occur in the armature core, armature inductors, and pole shoes.

The sum of these two groups of losses represents the difference between the input to a machine and its output. The commercial efficiency of a machine is equal to its output expressed as a percentage of its input, so that if it were possible to determine the losses, the commercial efficiency could be determined when the output of the machine is known.

The electrical losses in a machine can be determined by first measuring the resistance of the various circuits after they have reached a temperature corresponding to operating conditions, and then multiplying this resistance by the square of the current the circuit is carrying. The electrical losses in watts will vary directly as the square of the current and resistance to the first power.

When a motor is running without load, all the mechanical power developed in the armature is used in overcoming the stray-power losses, and the value of the mechanical power developed, in electrical units, is equal to the product of the counter electromotive force and the armature current. The stray-power losses in the machine will be practically constant for all loads, since there is a very small change in the field strength, or induction density; speed, friction, and windage losses are also practically constant for all loads.

To determine the stray-power loss of a machine that is operating as a motor is to determine its counter electromotive force, which is equal to the difference between the impressed voltage and the copper drop (current times armature resistance), multiplied by the armature current, when the machine is operating without load, the speed being the same as when loaded.

Example: Suppose a 20-hp., 110-volt motor has an armature resistance of .004 ohm; a shunt-field resistance of 55 ohms, and takes a current of 7 amperes when running without load, and it is desired to determine the commercial efficiency, when the armature current is 120 amperes. The counter electromotive force of the motor, running light, will be

$$110 - 7 \times .004 = 109.972 \text{ volts,}$$

and the stray-power loss will be

$$109.972 \times 7 = 769.804 \text{ watts.}$$

The electrical loss in the field will be equal to the field current times the voltage:

$$(110 \div 55) \times 110 = 220 \text{ watts.}$$

The electrical loss in the armature will be equal to I^2R , or

$$120^2 \times .004 = 57.6 \text{ watts;}$$

total electrical loss:

$$220 + 57.6 = 277.6 \text{ watts;}$$

and total losses:

$$277.6 + 769.8 = 1047.4 \text{ watts.}$$

The total current taken by the machine would be $120 + 2 = 122$ amperes, and the watt input would be

$$122 \times 110 = 13,420 \text{ watts.}$$

The input minus the losses represents the output, which, therefore, is

$$13,420 - 1,047.4 = 12,372.6 \text{ watts.}$$

The commercial efficiency, or the output expressed as a percentage of the input, will thus be found to be

$$\frac{12,372.6}{13,420} \times 100 = 92.2 \text{ per cent.}$$

More exact results may be obtained by operating the machine as a motor with a series of impressed voltages corresponding to the counter electromotive force generated in the machine when operating on various loads as a

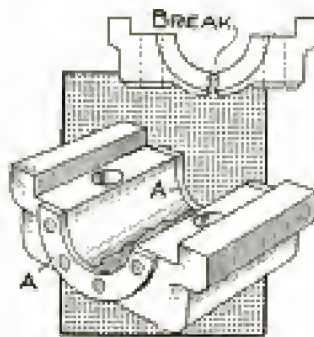
motor, and then computing the product of the counter electromotive force and armature current for each particular impressed voltage. The speeds should be the same in both cases. This will give the value of the stray-power loss for each load, but it will be found practically constant for most cases.

In the case of a generator, the stray-power losses are determined by operating the machine as a motor, with impressed voltages corresponding to the generated voltage for various loads when operating as a generator. The speeds should be the same in both cases.

The great advantage of this method of determining the commercial efficiency is the small cost of energy to make the test, and the possibility of testing a large machine with a small generator, or battery, as only the losses need be supplied.

Repairing a Broken Bearing Cap

The following describes a neat repair on the crankshaft bearing cap of an automobile engine. The engine was a very old type, and a new part could not be obtained. The break occurred at the point indicated in the drawing. Two strips, A, of $\frac{1}{8}$ -in. cold-rolled steel were cut in the shape of semicircles. The bearing cap was then planed off $\frac{1}{8}$ in. on each side. The plates were then riveted to the cap by means of $\frac{3}{16}$ -in. rivets. These rivets were of the flat-head type, set into countersunk holes. The heads were finished off flush on the sides. The repair made a neat job and at the same time was inexpensive.—Contributed by Adolph Kline, New York City.

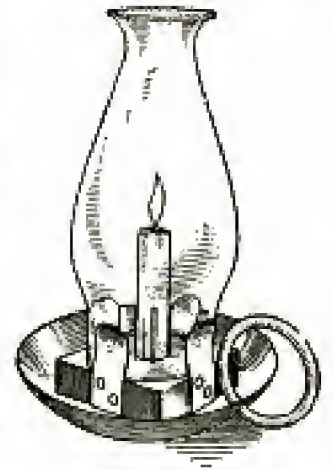


It is quite necessary to examine the oil pump on an automobile engine frequently, as clogging is one of the causes for an overheated motor.

A Cottage Candlestick

A very simple camp and cottage candlestick, that cannot be extinguished in a draft, can be constructed from an ordinary candlestick and lamp chimney.

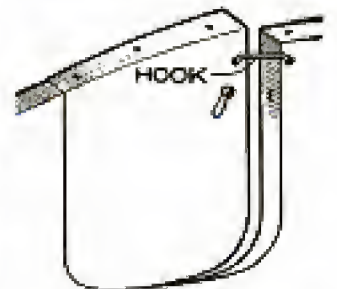
The candle pillar is removed and in its stead a block of wood, 3 by 3 by $\frac{7}{8}$ in., stained with a suitable color, is nailed to the base from underneath. On the four sides of the block pieces of metal are nailed to form clips for holding a No. 2 lamp chimney. Four small finishing nails, driven part way into the upper surface of the block, serve as a candle pillar, or holder.



The candles used are the short kind, or "twelves," with a small wick. These are less apt to smoke up the chimney. Such a candlestick produces a steady flame; can be used on a porch; is safe in passing near portières or curtains, and readily takes the place of an oil lamp on a writing table.

Ventilating Inclosed Automobile Bodies

When an automobile becomes uncomfortably warm for its occupants, one good way of ventilating it is by means of the doors. A hook made of an iron rod can be fastened in holes made in the body and door, as shown, which will cause sufficient draft to readily cool off the car, without danger of the door flying open and being caught or wrenched off.—Contributed by Abner B. Shaw, N. Dartmouth, Massachusetts.

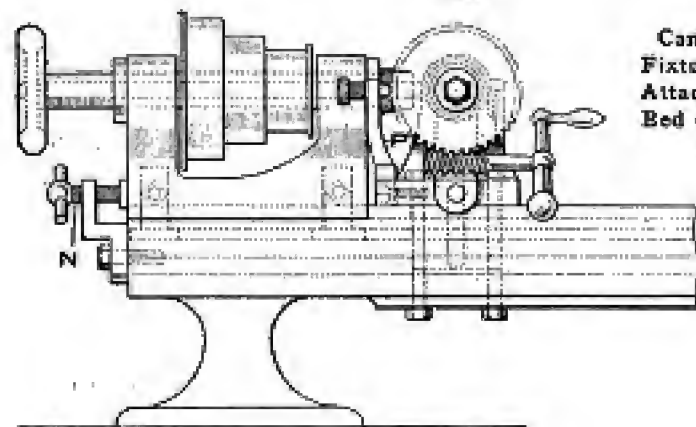
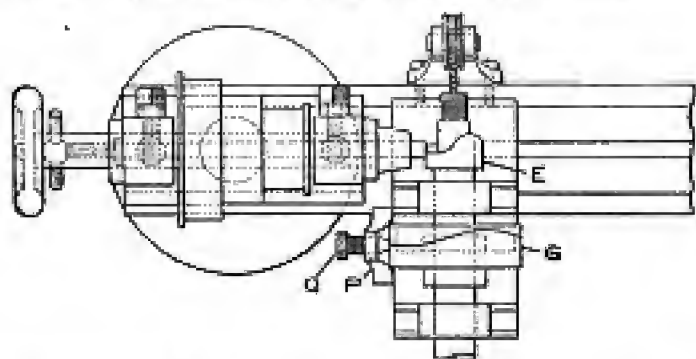


Cam-Cutting Fixture for a Bench Lathe

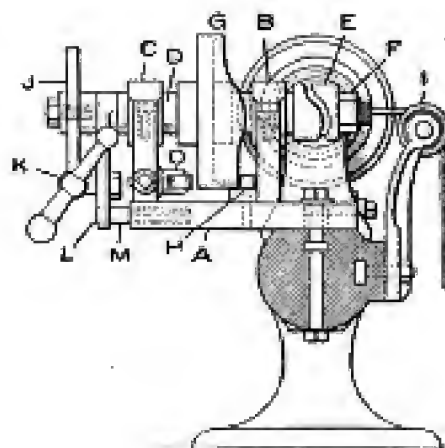
When it is necessary to cut a large number of cams to the same pattern, quite a little time can be saved, and greater accuracy gained, by using a cam-cutting attachment, one form of which is shown in the sketch. It consists of a base, A, clamped to the bed of the lathe, or milling machine, whichever is used. It is provided with two standards, B and C, bored to fit a cam spindle, D, at a height corresponding to the center of the cam-cutting tool. The spindle D is turned with a shoulder to fit against the work cam blank E, which is secured in a position by the nut F, and screw, at the end of the spindle. The master cam G is fastened to the spindle between the standards, and caused to bear against a guide roller, H—which is fastened to the base A—by means of a compression spring, fitting the spindle between the standard C and the hub of the master cam. If the spring is not desired, a weight can be used, by fastening it to one end of a cord, or wire cable, which passes over a pulley, I, and is attached to the spindle. The cams may be rotated by a handwheel attached to the

spindle. This, although the simplest method, is not very practical where slow feeds are necessary. A better way is to drive the spindle by means of a worm and gear. The gear J is attached to the outer end of the spindle. The worm K is fitted in bearings cast on a bracket, L. This bracket, at its upper end, fits in between the worm gear and a shoulder on the spindle, so that any lengthwise motion of the spindle will carry the bracket with it, thereby keeping the worm and gear in mesh constantly. The bracket is prevented from turning on its bearing by the stud M, fastened to it and made a sliding fit in the base A. The cam outline is cut by an end mill cutter fastened in the headstock spindle. In order to provide for end feed, an adjusting screw, N, and bracket are bolted to the lathe bed and, after slightly loosening the headstock bolts, the screw can be turned, causing the cutter to move for end feed, as required. If the cam-cutting attachment is fastened to the compound rest of the lathe, or on the table of a milling machine, no special adjusting screw is necessary.

In order to dispense with the weight or compression spring for keeping the master cam firmly pressed against the guide roller H, it will be necessary to have a double-faced cam. In this case another roller, O, must be provided which is fastened to the standard C, at a place directly opposite the roller H, the distance between the rollers corresponding to the width of face of the master



Cam-Cutting Fixture as It is Attached to the Bed of a Bench Lathe



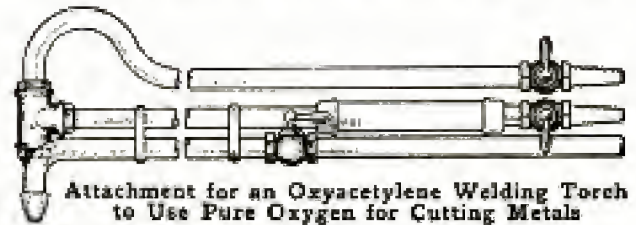
cam. As the two rollers are fixed in place, the cam, fitting between them, should have a radius corresponding approximately to the distance the rollers are from the center of the spindle. If a smaller cam has been developed for the desired motion, its outline must be developed on a blank of the required size, and this formed by the cutter in the usual way. In transferring the outline to the large blank, the small trial cam is put on at the cutter end of the spindle, and rests against a round rod fitted in the tailstock spindle. The master blank is fastened to the spindle in its regular position, the guide rollers being removed to permit the blank to enter. The outline is marked by a scriber attachment, which consists of a bracket, P, fastened to the base A. At a height corresponding to the center of the cam spindle, a hole is drilled and threaded for a tool-steel scriber, Q, adjustable for slightly different diameters of blanks by screwing it in or out. As the master blank slides back and forth, the scriber marks an outline corresponding to that of the small trial cam. If desirable to have a double-faced cam, the scriber bracket should be sufficiently wide so the scriber can be set over a distance corresponding to that between the rollers H and O.—Contributed by E. P. Fickes, Dayton, O.

Cutting Attachment for an Oxyacetylene Welding Torch

For cutting metal with an oxyacetylene welding torch, it is necessary to have a higher pressure of oxygen, at least 40 lb. A separate tank must be provided to produce this pressure, or the gas bought in a high-pressure tube. To make the cutting attachment for the torch, procure a piece of $\frac{1}{8}$ -in. pipe and bend it as shown. Make a tip, or if desired, several of them, with openings from the size of a pin point to $\frac{1}{2}$ in. in diameter. Attach a lever valve just in front of the torch handle, as shown, so that it can be operated with the thumb. Attach the auxiliary pipe to the lower pipe of the torch with

clamps, so that the point of the tip will be within $\frac{1}{4}$ in. of the regular welding tip.

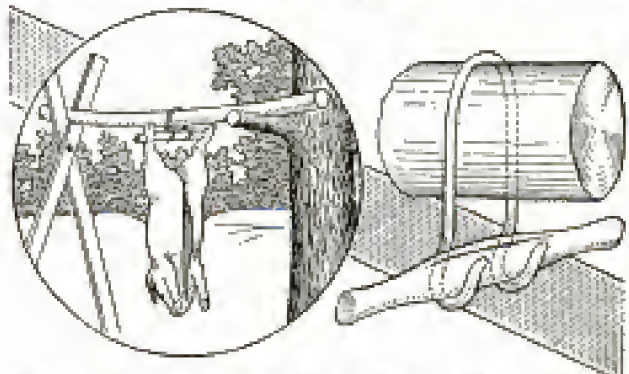
To use, heat the article to be cut with the welding tip, then turn on the



oxygen through the cutting attachment. With this attachment any kind of metal may be cut quickly and accurately. No changes are made on the welding torch to use this attachment.

A Gambrel Hook

Farmers use a pole to hang the hogs on at slaughtering time in winter. On this pole a gambrel stick is placed, the ends being inserted in the hock of the animal's leg. It is always a hard job to do the hanging and place the gambrel stick at the same time. A better way is to provide a double hook of metal, heavy enough to support the animal, and hang the gambrel stick on this hook, as shown. The metal may be square or round, bent into a U-shape of such dimensions that it will fit over the timber used in hanging the hogs and with a hook formed on each end. It is an easy matter to insert the gambrel while the hog is lying on the work

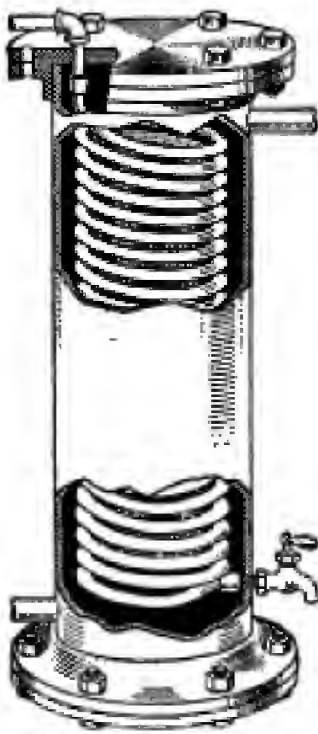


The Hook Provides an Easy Way to Hang a Hog after the Gambrel Is in Place

table, then lift it by the gambrel and place the latter on the hooks.—Contributed by Leslie R. Sutter, Towanda, Illinois.

Gas-Engine Exhaust Water Heater

The heater illustrated utilizes the heat from the exhaust of a gasoline engine, and can be used for heating a small shop, or for washing purposes. To make it, procure a piece of pipe, 12 in. in diameter and 36 in. long. Both ends are closed with caps, or plates. Two openings, one at each end of the pipe, are made for the exhaust to pass through, and a coil of pipe is inserted inside, its ends passing out at the top and bottom. Connect the heater as close to the engine as possible.



base, about 4 in. high, was built up with the brick in the bottom for the crucible. A crucible, 6 in. in diameter and 8 in. high, was purchased and set on the built-up base, then two walls of fire brick were built up on each side of the crucible to within 4 in. of the top of the shell. These walls should fit snugly against the crucible and the sides of the brick lining of the can. The cover for the top is lined with fire clay which is made to lie on top of the can so that it will form a tight fit.

A hole, 3 in. in diameter, was cut in the shell, on one side, and a 4-in. hole on the other. These holes should be located so that the smaller one enters the side at the center of one compartment formed by the walls and crucible, and the other makes an outlet in the other division, both holes being near the bottom of the can. The flame from a Bunsen burner, A, is directed through the smaller hole against the crucible, and by the walls deflected upward along the side of the crucible and over the top, thence down the opposite side and out. This method utilizes all the heat from the fire and

will melt brass, copper, or aluminum in a very short time.

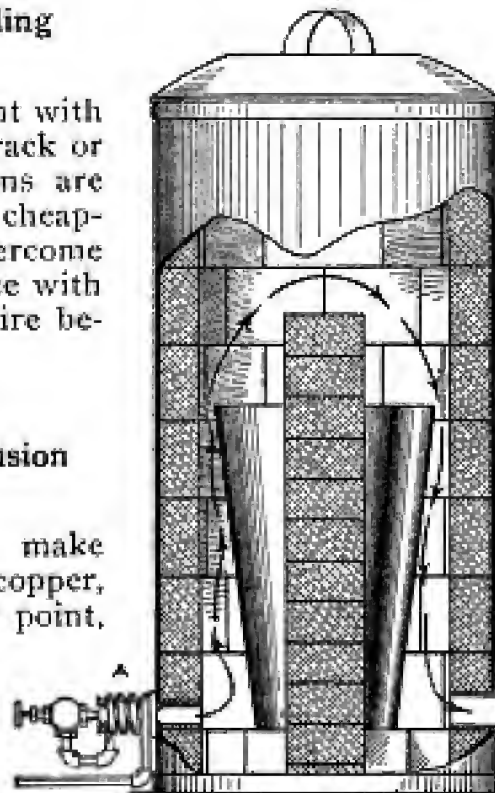
The type of burner and fuel tank used was the kind used by bicycle repair men in brazing small parts. — Contributed by A. H. Waychoff, Koenig, Col.

Cracking Prevented in Bending Lead Tubes

When small lead tubing is bent with sharp turns it will frequently crack or break, unless special precautions are used to prevent it. One of the cheapest and simplest methods to overcome the difficulty is to wind the place with several layers of fine flexible wire before trying to make the bend.

Furnace for Metals of Low Fusion Temperatures

Experimenters desiring to make small castings of zinc, brass, copper, and other metals of low fusion point, will find the simple furnace illustrated suitable to their requirements. The body of the furnace was made of an old 10-gal. milk, or cream, can, which was lined on the inside with fire brick, whereupon a



Milk Can Lined with Fire Brick Used as a Furnace to Melt Metals of Low Fusion Temperatures

A deep-red stain for woods is made of $\frac{1}{2}$ oz. alkanet root to two fluid ounces of turpentine.

Silencer for a Rifle

S. N. 12-3443

The silencer is made of a piece of steel tubing, having walls about $\frac{1}{4}$ in. thick, about 5 in. long, and of an inside diameter to fit snugly over the end of the gun barrel. The tube should have a number of holes, $\frac{1}{4}$ in. in diameter, drilled through it.

Another tube, about twice the diameter of the first one and 8 in. long, is drilled with a $\frac{1}{8}$ -in. drill to make it well perforated on the under side. Two pieces of sheet steel are cut or turned to fit the inside diameter of the large tube and holes are drilled in them, off center, the size of the outside diameter of the smaller tube. They are then placed in the ends of the larger tube so that the holes will coincide. The smaller tube is fastened in one end



Rifle Silencer Made of Two Pieces of Perforated Steel Tubing of Different Sizes

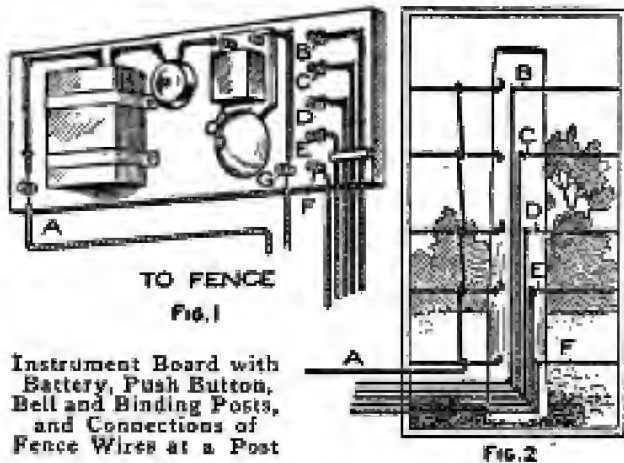
only, and at such a place that a small portion of its end will project out of the end of the large tube. After the parts are in place, they are brazed at all joints. A setscrew is placed in the projecting end of the small tube to hold the silencer on the end of the gun barrel.

An Electric Fence Rider

To do away with the necessity of walking or riding around a farm fence to see if it is in repair, the simple device illustrated may be used. A piece of 8-in. board is fitted, as shown in Fig. 1, with battery, push button, call bell, and binding posts, designated by the letters A, B, C, D, E, F, and G. The method of connecting the fence wires is shown in Fig. 2, the letters designating the binding posts to which the end of the wires are attached. Obviously, none of these wires must come in contact with any other wire, and it would, therefore, be better to use insulated wires from the board to the fence. In making a break for

a gate or opening in the fence, the wires must be connected by an underground cable and each one insulated from the others.

To make the test, connect the binding

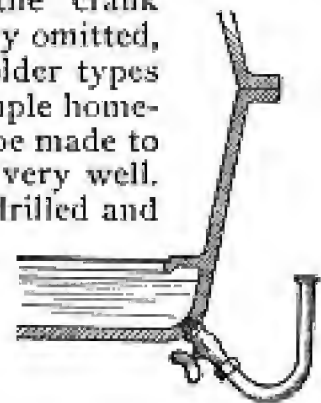


Instrument Board with Battery, Push Button, Bell and Binding Posts, and Connections of Fence Wires at a Post

post G to any one of the other binding posts, B, C, D, E, or F, and press the button. The resulting ring, or silence, of the bell will tell if the strand in the fence is continuous or broken. Reversing the connections to the wires will eliminate, to a great extent, a circuit caused by the fallen end of a broken wire, as it is not often a wire breaks so that both ends will come in contact with the other wires.—Contributed by R. H. Tuttle, Minneapolis, Minnesota.

Oil-Level Gauge for Automobile Crank Case

A smoky exhaust on an automobile can usually be attributed to an excessive amount of oil in the crank case. Oil gauges on the crank cases are frequently omitted, especially in the older types of engines, but simple home-made devices can be made to serve the purpose very well. A hole should be drilled and tapped in the lowest corner of the crank case for $\frac{1}{8}$ -in. pipe thread. Into this is screwed a pet-cock, having a male thread at one end and a female thread at the other. A piece of $\frac{1}{8}$ -in. pipe is then threaded at

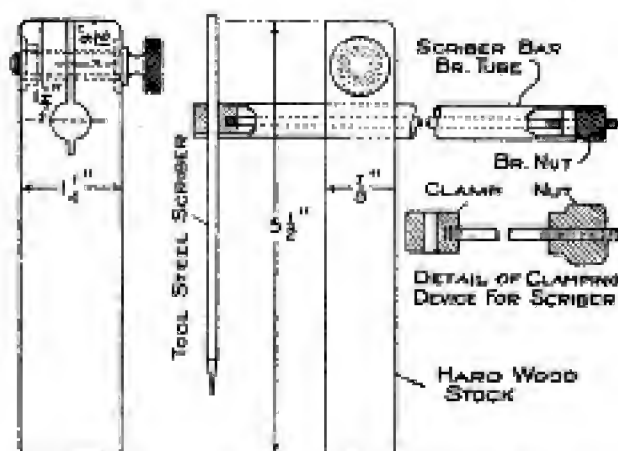


one end and bent so one side will be vertical when the pipe is screwed in position in the petcock. The amount of oil required in the crank case should then be determined, and the vertical pipe cut off at that level. The opening may be flared out to show the oil level more easily. All threaded connections should be white-leaded to insure tight joints. In bending the pipe, hot rosin should first be put in, thereby preventing dents or splits. The petcock should only be open when testing for the oil level or when desirable to add more.

A Distance-Marking Gauge

For gauging lines on a plane surface the ordinary marking gauge answers very well, but if it is necessary to gauge a line parallel with an edge, with a raised portion between the gauging point and the point where the line is desired, the ordinary gauge is useless. It was to overcome this difficulty that the distance-marking gauge was designed, and with it a line may be gauged on the inside of the bottom of a box or drawer, parallel with any of its sides. The scriber bar, being round, can be swung to the right or left and clamped in either position, so that the scriber point can reach places that could not be conveniently reached in any other way.

The head, or stock, is made of hard



This Gauge will Scribe a Line on Uneven Surfaces over High Parts, as a Drawer Side

wood, and is bored to receive the scriber bar, which is made of brass tubing. This piece of tubing, in the gauge

illustrated, is $\frac{1}{8}$ in. in outside diameter and $\frac{5}{16}$ in. on the inside. The head-clamping device is made as shown, all parts being of brass. The knurled thumbscrew, running completely through the head, is threaded to turn in a plate, let into the side and fastened with two small screws; the same method being used for the plate under the shoulder of the thumbscrew.

The scriber is made of $\frac{1}{8}$ -in. tool steel, hardened at the point. The clamping device for the scriber consists of the knurled nut, turned with a shoulder to fit the inside of the scriber bar and tapped to receive the threaded end of a $\frac{1}{8}$ -in. brass rod that is screwed into the scriber clamp at the opposite end of the bar. This clamp is a short piece of brass rod turned to a sliding fit inside of the tube. The clamping device should be fitted to the tube, and the hole for the scriber drilled through the tube and clamp at the same time.—Contributed by J. A. Shelley, Brooklyn, New York.

Riveting Head for Thin Tubing

The sketch illustrates a very simple, cheap, and effective device for riveting joints in thin tubing, such as rain pipes, stovepipes, furnace pipes, and the like. Instead of merely telescoping them together, making a very insecure and unmechanical connection, this tool will enable all joints to be securely riveted where they cannot be soldered.

The head, Fig. 1, is made of machine steel with slightly countersunk holes drilled in the periphery and then case-hardened. For convenience, the holes are drilled all around and spaced about $\frac{1}{16}$ in. apart, so that the walls will not break out in use. This will make it easy to locate the holes, much more so than if there were only a few.

In construction, a number of disks, about 6 or 8, of varying diameters are turned up and countersunk, and a $\frac{3}{4}$ -in. hole is drilled through their centers, whereupon all are casehardened. The different diameters are necessary for the different-sized tubes. The disks must be about $\frac{1}{16}$ in. smaller than the

tube diameter, but not more than $\frac{1}{8}$ in. smaller.

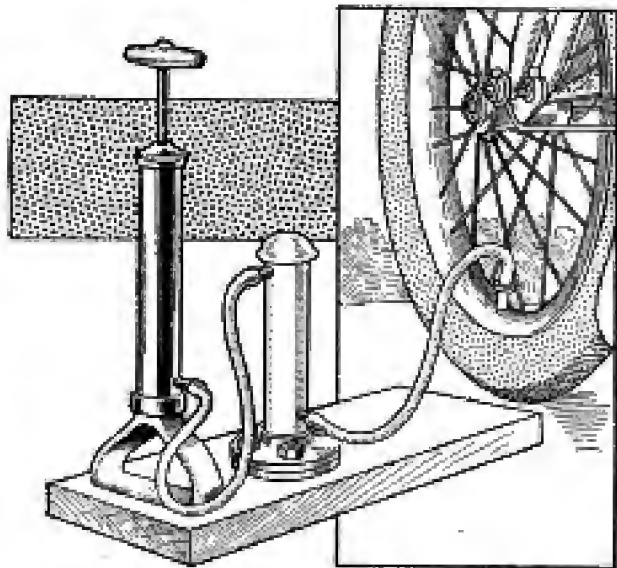
A piece of $\frac{5}{8}$ -in. gas pipe, A, is threaded on one end for 2 in.; the remainder is turned down to $\frac{3}{4}$ -in. outside diameter, and a collar, B, is fitted to turn on the pipe threads at the end and fastened there with a rivet, C. The desired head for the size of work at hand is slipped on the pipe against the collar B, and a fixed washer, D, is placed outside on the pipe and held with a hexagon nut.

When in use, the head is inserted in the pipe, and by tapping the outside of the pipe the location of the head can be determined and the holes punched with a tool similar to a belt punch. Place a rivet in the hole, head up, and drive it down. The countersink of the hole in the head will form the rivet head on the inside. The head must be smaller than the tubing in order to clear the rivet head, yet not so small but that the tube will spring back to its original shape when the riveting is finished.

The head can be placed in a straight or curved pipe, around inside of elbows, and all standard angles, with the use of a length of wire-wrapped garden hose attached with a clamp to the free

Injecting Puncture-Sealing Compound into Tires

The body of the injector consists of a piece of 2-in. pipe, 8 in. long, with a cap screwed on the upper end, and a



Pressure Applied to the Cylinder Forces the Puncture-Sealing Fluid into the Injured Tire

flange on the lower. A tire valve is soldered into a hole drilled in the pipe near the upper end, and a piece of $\frac{1}{8}$ -in. pipe screwed into a tapped hole at the bottom. The cylinder is mounted on a base of hard wood that is large enough for a foot pump also. To fill the cylinder, the upper cap is unscrewed. When the cap is replaced, a pressure is put on the fluid, after attaching a hose between the small outlet pipe and the tire valve.

To Prevent Rust Forming on Tools

Those who desire to use a rust preventive will find that if the tools are wiped with a cloth slightly saturated in mercurial ointment, they will obtain the best results possible. It is not necessary to leave more than a trace of the ointment on the steel. A cloth so impregnated that it will smear a pair of spectacles a little will answer.

This ointment is the very best possible to use on guns, to prevent them from rusting. It will also prevent the barrels from leading and will remove lead from the rifles. It has no action whatever on the metal of the barrel.

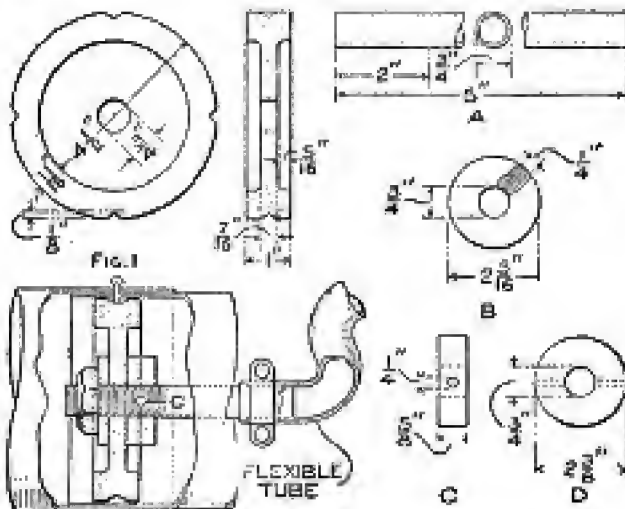
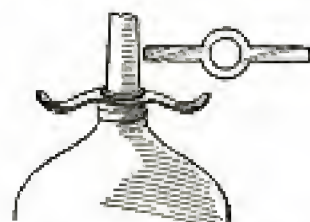


Fig. 2
Head to Insert in a Pipe to Serve as an Anvil in Riveting the Joints

end of the gas pipe, as shown in Fig. 2. This also provides a means of keeping the head straight when it is used in a long pipe.—Contributed by J. B. Murphy, Plainfield, N. J.

Finger Rest for an Oilcan

In places where an oilcan is used very frequently, and especially where it may be covered with oil, making it

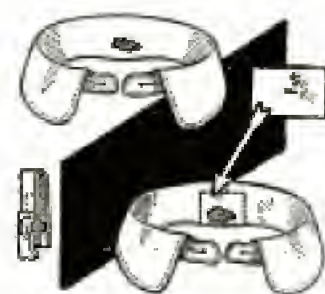


hard to hold, a finger rest can be provided which will serve several purposes. A thin double-winged washer is made

and provided with a hole, giving it a tight fit when slipped over the spout to the threaded end. It can then be soldered in place, and the projecting ends bent to conform closely to the finger positions when using the can. This attachment not only prevents slipping of the can when covered with oil or grease, but also provides a good grip for unscrewing the spout.—Contributed by J. J. Kolar, Maywood, Ill.

Holding Collar with a Torn Buttonhole

In the laundry I find a great many collars with the rear buttonhole so badly torn that it is impossible for the



collar button to hold it in place. Otherwise the collar is good and can be worn a number of times, but is usually thrown away. To make use of such a collar,

take a piece of linen or cardboard and make a hole or slot with a knife point like a buttonhole, and place it in the pocket of the collar over the torn buttonhole. This will aid the button in holding the collar in place.—Contributed by John T. Morrison, Philadelphia, Pa.

When an inner tube is immersed in water to discover a leak, make a mark around the hole with an indelible pencil.

Removing Globes from Flash Lamps

Small electric globes in flash lights are very difficult to remove from the socket when it becomes necessary to put in a new one. When in the socket, the outside surface is so smooth that the fingers will not turn it. I have found a very good method which consists in using a piece of rubber tube about $\frac{3}{8}$ in. in diameter and $1\frac{1}{4}$ in. long, and pressing its end against the globe, then turning it. In this manner a globe can be easily removed or replaced. A good place to keep the piece of rubber tubing is in the coil-spring space in the rear of the cap on the flash-lamp casing.

Plugging a Petcock on a Gasoline Tank

If the valve is lost from the petcock on the lower part of the crank case, or gasoline tank, or similar place, do not plug the hole, A, where the valve came out, but unscrew the petcock and fit a wood plug in the upper end. Then there is no danger of the plug losing its hold and causing further leakage.

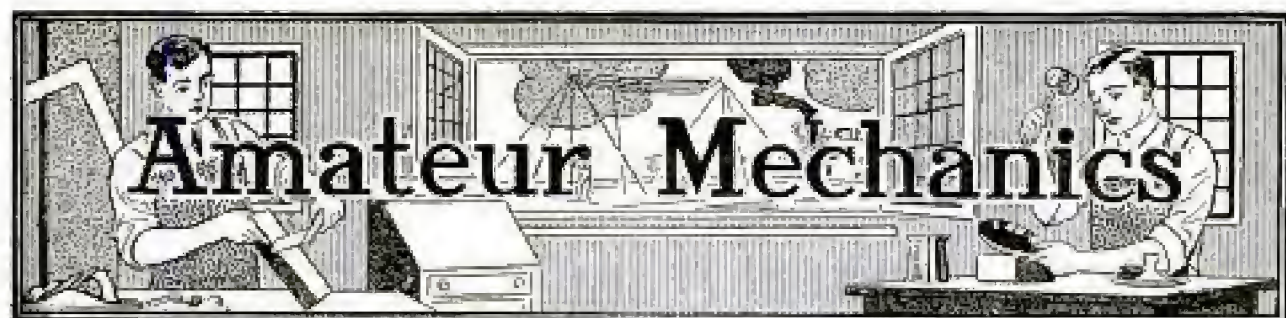


Erasing Shield for Typewriter Rolls

When erasing a word or letter while the paper is in the typewriter, a much neater job can be done if the shield



here illustrated is used. It consists of a piece of thin metal, about $\frac{3}{4}$ in. wide and 2 in. long, with a number of holes cut in it, as shown. The metal plate is then bent to conform to the shape of the roller. In erasing, the plate is laid over the paper on the roller, and the word or letter to be erased is brought under one of the openings. It can then be erased without danger of marring the adjoining letter.



A Photographic Worktable for Small Quarters

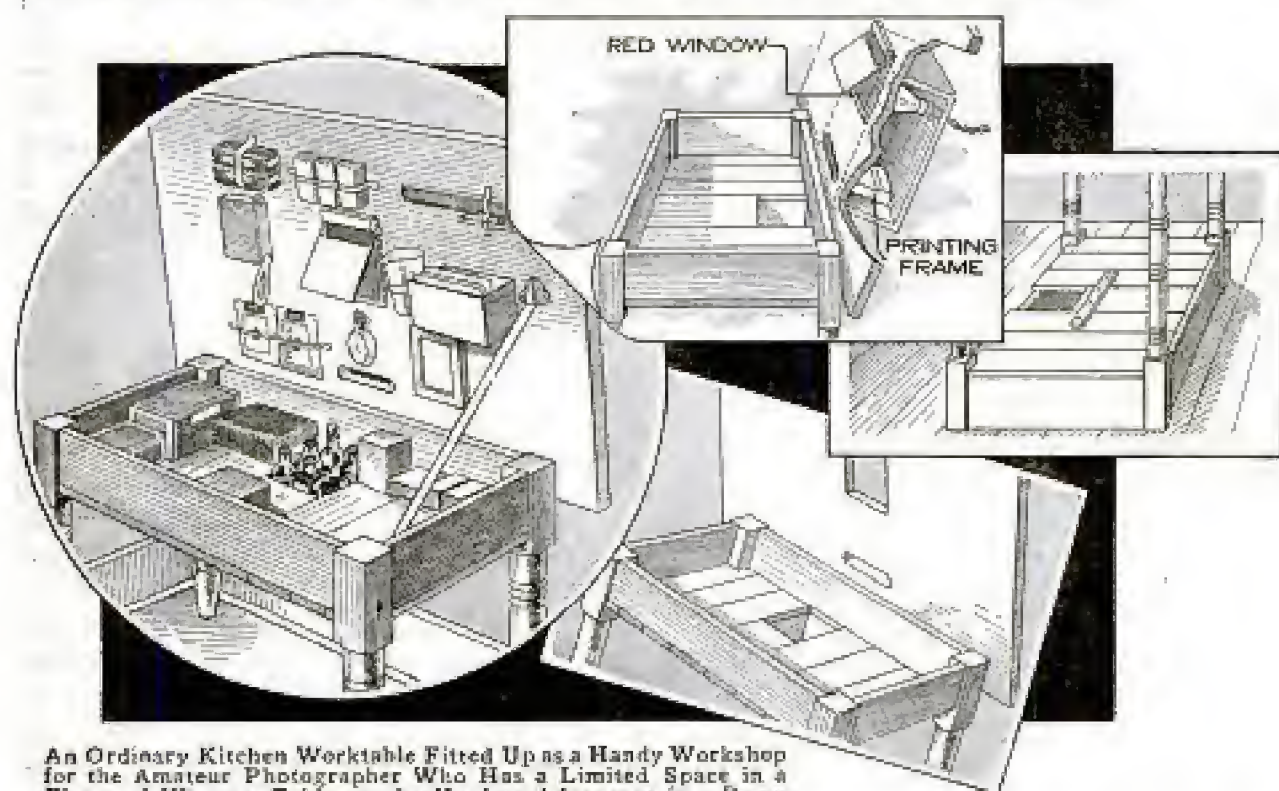
By K. V. REED

FLAT dwellers have no space at their disposal for a person to work at photography, and the bathroom must take the place of a dark room. As this was very inconvenient in my case, I constructed a table, that from all appearances was nothing more than a large-size kitchen worktable, and such a table can be used in case the builder does not care to construct it.

The table is turned upside down and the top removed by taking out the screws. The top is made of several pieces glued together and will remain

edge of the rails. If a very neat job is required, these boards should be set inside on strips nailed to the inside surfaces of the rails, at the proper place to make the boards come flush with the under edges of the rails.

At the back side and in the center of the new bottom, a hole is cut, 6 or 7 in. square, and a box fastened beneath it, to form a bottom several inches below the main bottom. In this space bottles filled with solutions are kept. The main bottom should be painted with an acid-proof varnish.



An Ordinary Kitchen Worktable Fitted Up as a Handy Workshop for the Amateur Photographer Who Has a Limited Space in a Flat, and Where a Table can be Used to Advantage in a Room

in one piece. It is then hinged at one side to the top edge of the rail, so that it can be turned back like a trunk, or box, cover.

Boards are then nailed to the under

The space in the table is then divided, and partitions set up, which can be arranged to suit the builder.

Another attachment, which comes in exceedingly handy, is the ruby light.

This consists of a box, large enough to receive a printing frame at the bottom. Two holes are cut in the table top, at the right places to make a window for the light and a slit for the printing frame. When the table top is raised, the box with the light is fastened over the openings with hooks,

the arrangement of which will depend on the size and shape of the box. In closing, the lamp box is removed, and pieces of board are set in the holes. This can be easily arranged, if the holes and blocks are cut on a slight slope, so that the latter when set in will not fall through the openings.

Back Thrust Prevented on Skis

To overcome the difficulty of skis slipping back when walking uphill either of the two devices shown is



Two Methods of Making an Attachment to Prevent the Backward Thrust of a Ski

good, if the attachments are fastened to the rear end of the skis.

The first represents a piece of horsehide, about 4 in. square, tacked on the ski and with the hair slanting backward. This will not interfere with going forward, but will retard any movement backward.

The other consists of a hinged portion that will enter the snow on a back thrust. As the ski end is thin, a block of wood must be attached to it on the upper side, and the projecting piece hinged to the block. The bevel at the end allows it to dig into the snow when the ski starts back. In going forward, it will swing out of the way freely.

Crystallization Shown on a Screen

The formation of chemical crystals can be shown in an interesting manner as follows: Spread a saturated solution of salt on a glass slide, or projection-lantern glass, and allow it to evaporate in the lantern's light or beneath a magnifying glass. The best substances to use are solutions of alum or sodium, alum being preferable. Ordinary table salt gives brilliant crystals which reflect the light to a marked degree. For regular formation, where the shape of the crystal is being studied, use a solution of hyposulphite of soda.

Many startling facts may be learned from the study of crystals in this manner, and watching them "grow" is great sport even to the chemist.—Contributed by L. T. Ward, Des Moines, Iowa.

Furniture Polish for Fine Woods

Boiled olive oil, to which a few drops of vinegar has been added, makes an excellent furniture polish for very fine woods. It will be found to work nicely on highly polished surfaces, and also for automobile bodies. It is applied in moderate quantities, and rubbed to a luster with a flannel cloth.

Paper Glider That Loops the Loop

By C. A. THOMPSON



Fig. 1



Fig. 2

corners of the wings are bent up as in Fig. 2, and, further, the rear corner of the keel is bent at right angles, Fig. 7, whereupon it is thrown in the ordinary manner. It then takes the course shown in Fig. 8.

A Water Filter

A cheap and very effective water filter can be made of a flower pot by plugging the hole in the bottom with a piece of sponge and fitting it as follows: Place powdered charcoal on top of the sponge to a depth of 1 in., then 1 in. of clean silver sand, and lastly 2 in. of small stones and gravel. It is hung with a bail at the top.

The usual paper glider shaped as shown in Fig. 1 can be made to loop the loop and make corkscrew flights if prepared according to sketches herewith. It should be carefully made in the first place so that in its regular form it flies perfectly straight.

To make the glider loop, the rear corners of the wings should be turned up at right angles, as in Fig. 2, and the glider launched with a great deal of force with the nose pointed slightly upward. This will require some practice, but one soon learns the trick. After looping once, as shown in Fig. 3, the glider descends in vol-plane. This form of glider will also right itself, if dropped from a height, nose downward, as shown in Fig. 4.

For a corkscrew flight the glider is prepared as in Fig. 5; one rear corner being bent up and the other down. In this form it flies horizontally, or downward, while rapidly rotating around its longitudinal axis, as shown in Fig. 6.

To make a spiral descent, the rear

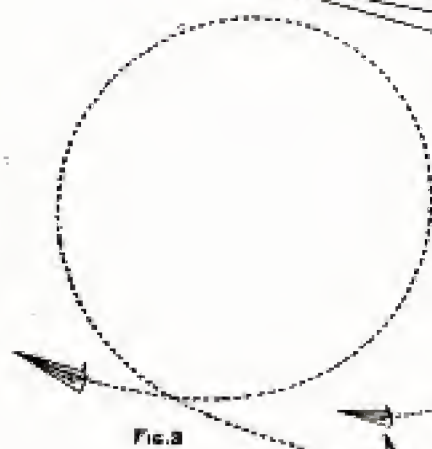


Fig. 3



Fig. 4



Fig. 5

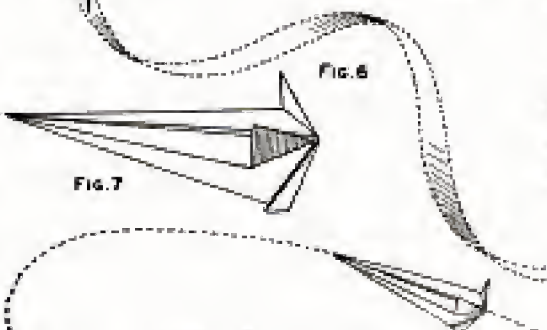


Fig. 6

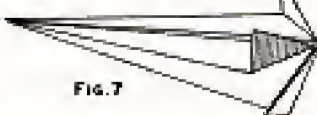


Fig. 7



Fig. 8



Ordinary Paper Glider and the Manner of Throwing It to Make the Different Flights

An Electric Chime Clock

By JOHN E. MAHLMEISTER.

IN the construction of this clock one perfectly good and accurate alarm clock and the works of an old or discarded one are used. The clock for the accurate time is set into a frame, or casing, made of thin boards which have a circular opening cut in them to fit

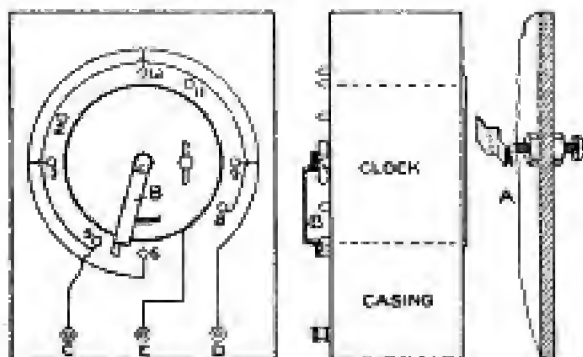


FIG. 1

The Alarm Clock in Its Case and the Location of the Contact Pins and Contact Lever

snugly on the outside casing of the clock. The back of the clock and casing are shown in Fig. 1. A circular line is drawn on the casing, about 1 in. larger in diameter than the clock, and brass machine screws with two nuts clamping on the wood back, as shown at A, are set at intervals so as to be opposite, or just back of, the hour marks 2, 3, 5, 6, 8, 9, 11, and 12. A contact spring, B, is shaped as shown and soldered to the knurled knob on the back

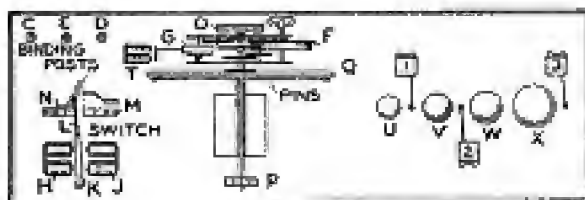


FIG. 2

Location of the Clock Works, Magnets, Binding Posts, Gongs and Strikers on the Baseboard

of the clock used for setting the hands in a position where it will travel or be parallel with the minute hand. The end of the contact spring should be shaped so that it will slide over the points of the screws easily, but in good contact. The ends of the screws should

be filed to a slightly rounding point. The wiring diagram for this part of the apparatus is clearly shown, and the terminals are connected to binding posts C and D. The binding post E is connected to the metal part of the clock.

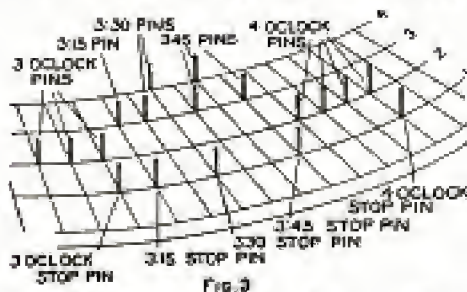
The chime part is made entirely separate and can be located at any reasonable distance from the clock. It is propelled by the works from an old clock, as shown at F, Fig. 2. The old clock is prepared for use by removing the hands, balance wheel and escapement so that the wheels will turn freely. To prevent the works from running too fast, a piece of sheet brass, G, is soldered to the shaft running at the highest speed. The brass should be as large as the space will admit. It forms a fan to catch the air and retard the speed, and also provides a means of stopping the works by the electric mechanism.

The parts for the gongs and electrical apparatus are supported on a baseboard, $\frac{3}{4}$ in. thick, 6 in. wide, and 18 in. long. The automatic switch is located at one end of the base, and consists of two sets of magnets, H and J, with an armature, K, to which is attached a stiff contact wire, L. This wire is to make contact with the spring M when the armature is drawn by the magnets J, and with N when drawn by the magnets H. The springs M and N are made of thin sheet brass, bent as shown, and mounted on the base.

A piece of wood, O, on which to mount the works of the old clock is mortised into the base. Another standard, P, of the same height as O, is also mortised into the base to provide a bearing for the end of the shaft which carries the wood disk Q, the opposite end of the shaft being connected by means of a ferrule and soldered to the end of the minute-hand shaft. The shaft should be well lined up, so that it will turn freely. The wood disk is $\frac{1}{4}$ in. thick and about 6 in. in diameter.

Mark four circles on the face of the disk, near the outside edge and $\frac{1}{4}$ in. apart. Step off the outside circle into 150 parts and draw a radial line from each mark across the four circular lines with the straight edge on the center of the disk. An arc of the disk is shown in Fig. 3, where trip pins are driven in for making the electric contacts. This part of the arc shows the method of locating the pins for the hour from 3 to 4 o'clock, with the intermediate pins for the quarter, half, and three-quarter-hour contacts. The intermediate pins are arranged in the same manner for all hours; but the hour pins, on the second circle, run from 1 pin to 12 pins consecutively. Ordinary pins, with the heads cut off, are used and should be driven in accurately on the division lines to secure proper results.

The arrangement of the springs is shown in Fig. 4. These springs, when pressed together, will close the circuit for ringing the gongs. They are made of thin sheet brass, bent as shown at R, and fastened to a piece, or block, of hard wood with screws, as shown at S. The springs numbered 3, 5, 7, and 9 are the ones made as shown at R for sliding over the pins in the disk Q, and their ends should clear the face of the disk about $\frac{1}{8}$ in. The springs 1, 2, 4, 6, and 8 are about $\frac{1}{2}$ in. shorter and have their ends bent up at right angles so that they will almost touch the long ones. The spring 1 should be a little shorter than 2. When fastening the

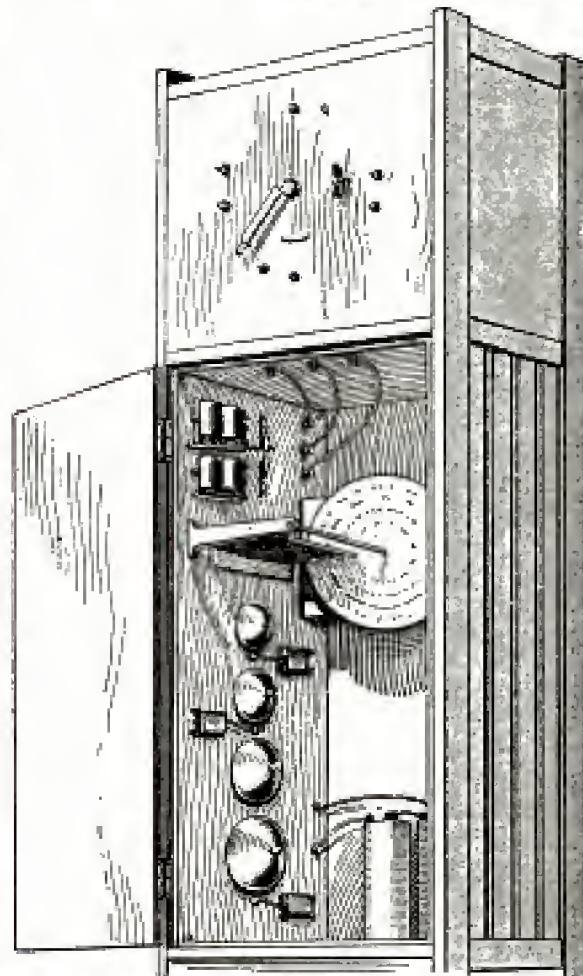


The Pins are Accurately Set in Four Circular Lines and on Radial Lines

springs to the block of wood, be sure that no two springs touch and that each one is separated from the other to form no contact until the pins in the wheel force them together. The block is then fastened to the base under and

parallel with the shaft carrying the disk Q, as shown.

The starting and stopping of the clockwork F is accomplished by means of a set of bell magnets, arranged, as



The Parts Constructing the Chime are Placed in the Clock Frame below the Works

shown at T, Fig. 2, with the wire attached to the armature bent to touch the brass wing of the fan G. The armature must not vibrate, but stay against the magnet cores while the current is flowing through them, thus allowing the clock wheels to turn, and as soon as the current is cut off, the armature will spring back and stop the wheels.

Arrange four gongs, U, V, W, and X, as shown in Fig. 2, and also three bell magnets with clappers 1, 2 and 3. These gongs should be selected for tone as in a chime clock. The connections to the bell magnets 1, 2, and 3 should be direct to the binding posts so that the armature will not vibrate,

but give one stroke. For instance, bell magnet 1 should produce one stroke on the gong U when the current is on, and one stroke on the gong V when

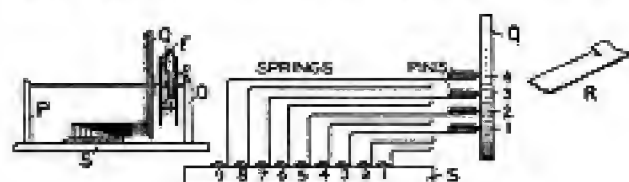


FIG. 4

The Contact Springs are Operated by the Pins on the Disk Wheel

the current breaks. The magnets 2 should cause the clapper to strike once on the gong V when the current is on, and to make one stroke on the gong W when the current is broken. The magnets 3 produce only one stroke on the gong X at a time, which is used to sound the hours.

The parts are connected up electrically as shown in Fig. 5. The lines between the clock, Fig. 1, and the bell-ringing part, Fig. 2, are connected from C to C, D to D, and E, Fig. 1, to the zinc of a battery and from the carbon to E, Fig. 2. Two dry cells will be sufficient for the current.

The working of the mechanism is as follows: Suppose the time is 6 minutes of 3 o'clock and the contact spring on the back is near the 11 pin. As soon as it touches the pin, the armature K of the switch will be drawn in contact with the spring N, then when the contact spring touches the 12 pin, the current will flow into the

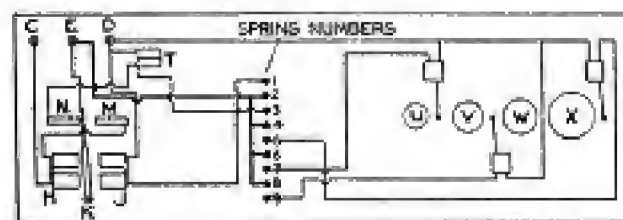


FIG. 5

The Wiring Diagram for the Location of the Wires on the Under Side of the Base

magnets T and release the wheels of the clockwork F, which turns the disk Q, and the three pins in the second row will pass over the spring 5 and press it in contact with the spring 4 three times, causing the gong X to toll out

3 o'clock. As the contact spring B will be on the contact pin 12 for about 1 minute, the wheels of the clockwork F would continue to turn and the bells ring, if it were not for the stop pin located on the outside, or first, circle of the disk Q, which pin is set in line with the last pin in the set of pins for the hour, or, in this instance, in line with the third pin. When the stop pin has passed the spring, the connection through the magnets T is broken and the clockwork F stops instantly. When the spring B strikes the 2 o'clock pin, or 10 minutes after 3 o'clock, the armature K is drawn over to N, and at the 3 pin, or 15 minutes after 3 o'clock, the bells U, V, and W will ring and then the stop pin will break the current, and so on, at every 15 minutes of the 12 hours.

Hinges Used to Substitute Night Bolt

One of the safest devices for bolting, or locking, a door against intruders is to use two sets of hinges. The extra set is fastened to the door and frame in the same way but directly opposite the regular hinges. It may be necessary to file the extra hinges and pins in order to separate and bring the parts together easily. The usual door lock need not be used with this arrangement, as the hinges are exposed only on the inside of the room and cannot be tampered with from without.

Propellers for a Hand Sled

Desiring to propel my hand sled with power transmitted by cranks and wheels, I set about to procure the necessary materials. Two medium-sized buggy wheels were found in the back yard of a blacksmith shop, which were procured for a nominal price. The felloes of these wheels were removed, the tenons cut from the spokes and nails substituted, which were driven in their ends so that about $\frac{1}{2}$ in. of the body with the head projected. The heads were then removed and the nail ends sharpened.

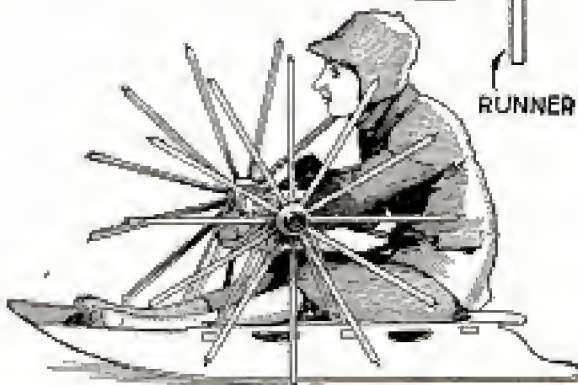
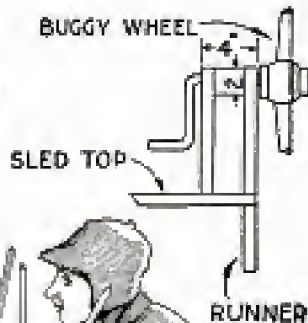
The hubs were plugged with pieces

of wood, whittled to tightly fit the holes. A hole was then bored exactly central through each plug for a $\frac{1}{2}$ -in. rod. This size rod was procured and bent to form a crank, the bearing end being threaded for a distance equal to the length of the hub.

Two pieces or blocks of wood, 2 in. square and 4 in. long, were used as bearings. These were bored centrally through the long way, to receive the $\frac{1}{2}$ -in. rod just loose enough to make a good bearing. These bearings were supported by a pair of braces made of strap iron, about $\frac{1}{4}$ in. thick and $\frac{3}{4}$ in. wide. The length of the iron will depend on the size of the wheels and the height of the sled runner. The braces were shaped as shown. The center of the bearing hole must be as high from the surface of the ground as the distance the spoke ends are from the center of the hub hole.

The crank is then run through the bearing hole and a nut run on the threads and a washer placed against the nut. The wheel is then slipped on the axle, and another washer and nut run on tightly. Both wheels, bearings, cranks, and brackets are

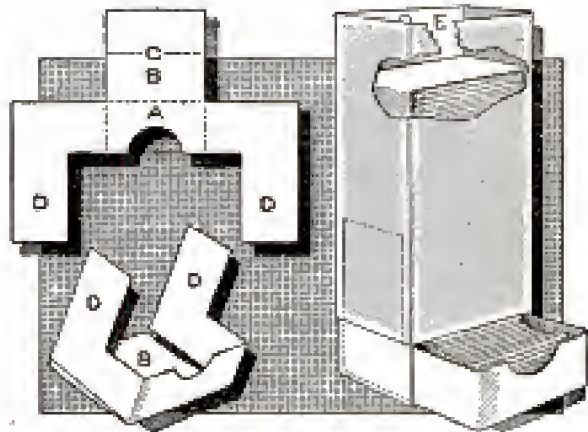
Sled Propelled
by Revolving Wheels
Turned by Cranks,
the Pointed Nails
Doing the Pushing



made alike. The brackets are fastened with small bolts to the sled top.—Contributed by Justin Stewart, Wallingford, Conn.

A Self-Feeding Match Box

With the addition of the simple device here illustrated, any match box can be converted into one of the self-



The Attachment Consists of a Receptacle Fitting into the End of a Match Box

feeding type. A piece of tin, or cardboard, is cut, as shown at A, the exact size depending on the match box used. The piece cut out is folded on the dotted lines, the cover on the match box is removed, and the part B pushed into the end of the box beneath the matches. The part B is twice as long as the depth of the box, therefore it enters the box as far as the line C. The flaps D rest against the outside of the box, and are held in place by the box cover. The matches feed into the box formed of the tin or cardboard as fast as used, while the burnt ones can be placed in the upper part E.

Corks-in-a-Box Trick

Procure a pill box and a clean cork. Cut two disks from the cork to fit in the box, and fasten one of the pieces centrally to the inside bottom of the pill box with glue.

To perform the trick, put the loose disk in with the one that is fast, and then open the box to show both corks. Close the box and in doing so turn it over, then open and only one cork will be seen. Be careful not to show the inside of the other part of the box with the cork that is fastened.—Contributed by Fred B. Spoolstra, Yonkers, N. Y.

A Substitute for a Pen

Recently I was hard pressed for a pen, and as none could be found and the hour was late it was necessary to



A Notch Cut in the Tapered Part of a Wood Stick Forms a Substitute Pen

find a substitute. I fashioned a pen from a piece of boxwood, and was agreeably surprised at the excellent results obtained with it. The wood was sharpened like a lead pencil at one end, and a groove was cut out of the tapered part to hold the ink.—Contributed by Richard F. Pohle, Lynn, Massachusetts.

A very convenient method of keeping shipping tags at hand is to slip them on a desk spindle.

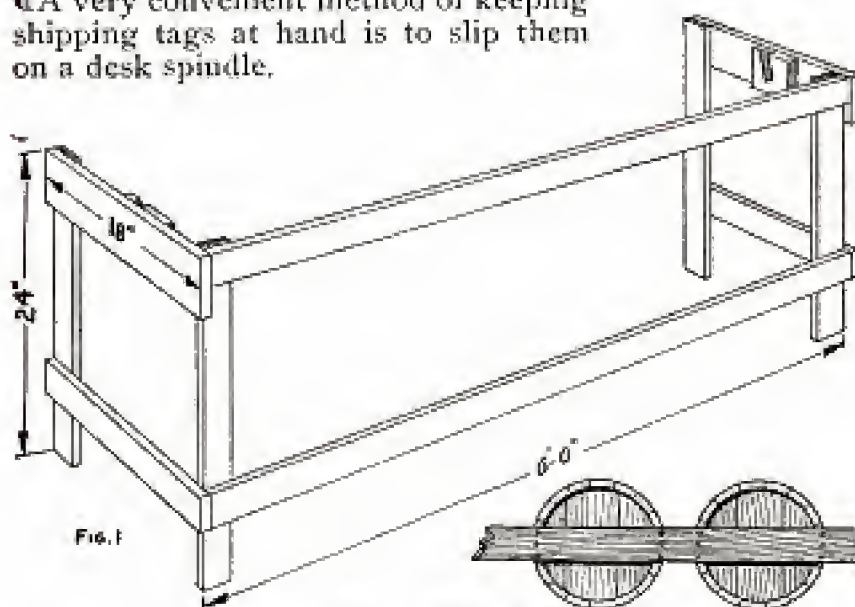


Fig. 1

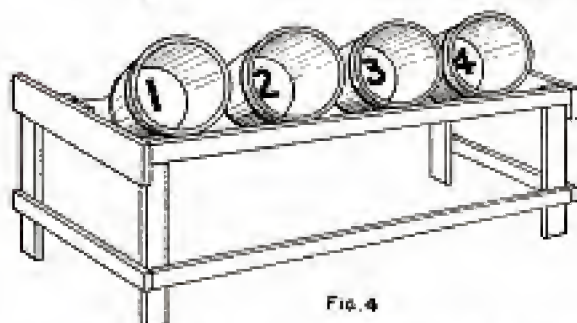


Fig. 4

A Bucket-Ball Game

This is a new indoor game which follows out in principle the regular baseball play. It is an exciting and interesting pastime, and while a certain amount of skill is required to score runs, a person who cannot play the regular game can score as many runs, and as often, as the best players in the national leagues.

Anyone that is just a little handy with tools can make the necessary parts for this game. The tools required are a hammer and a saw, and the materials consist of some finishing nails; three strips of wood, 6 ft. long, 2 in. wide, and 1 in. thick; two strips, 18 in. long, 4 in. wide, and 1 in. thick; four strips, 24 in. long, 2 in. wide, and 1 in. thick; two strips, 18 in. long, 2 in. wide, and 1 in. thick; two blocks, 4 in. square, and 1 in. thick, and four wood buckets.

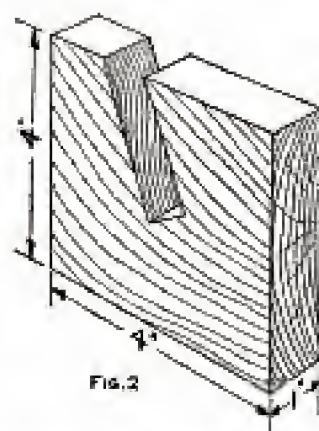
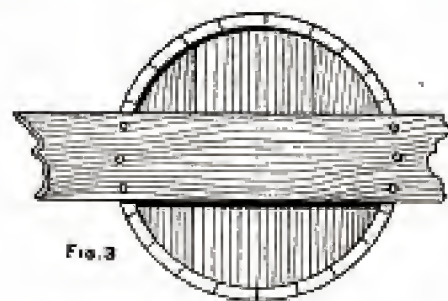


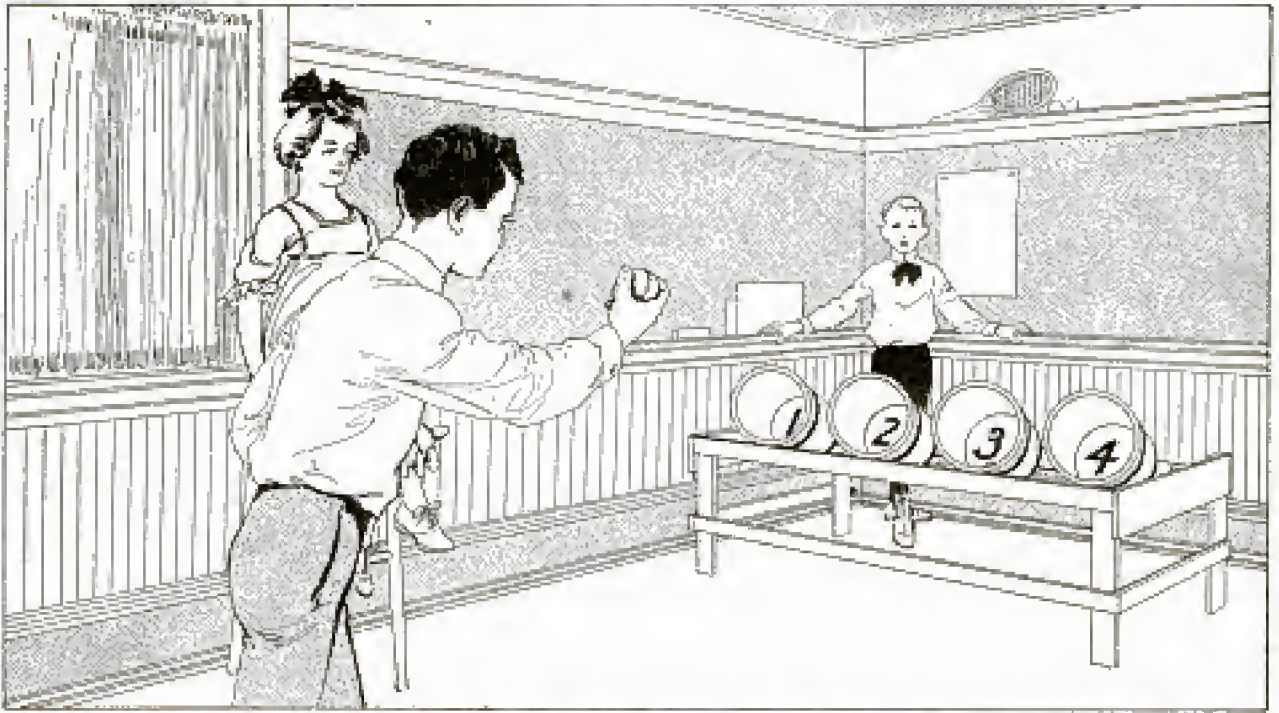
Fig. 2



Fig. 3



The Frame is Made Up without a Back, to Hold the Buckets at an Angle That Makes It Difficult to Toss the Ball So That It will Stay in Any One of Them



The Player must Throw the Ball So That It will Enter and Stay in One of the Buckets, Which Designates the Base Hits by the Number in Its Bottom

A frame is built up as shown, 6 ft. long, 18 in. wide, and 24 in. high, without a back. One of the long pieces is fastened to the bottoms of the buckets as shown, spacing the latter equally on the length of the piece. This piece is then set in notches cut in the blocks of wood at an angle of 45° . These blocks are fastened to the upper cross-pieces at the ends of the frame. The upper part of the buckets rest on the upper front piece of the frame.

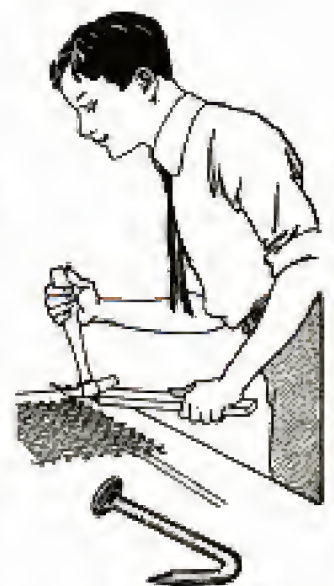
The rules for playing the game are as follows: Three baseballs are used. The players stand about 10 ft. distant and in front of the buckets. Each player, or side, is only permitted to throw three balls an inning, irrespective of the number of runs scored. Any kind of delivery is permitted, but an underhand throw will be found most successful. The buckets are numbered from 1 to 4, and represent, respectively, one, two, and three-base hits, and home runs. The one in which the ball stays designates the run.

Plays are figured as in a regular ball game. For instance, if a ball should stay in bucket No. 2 and the next in bucket No. 3, the first man would be forced home, counting one run, and leaving one man on third base.

If the next ball stays in bucket No. 4, the man on third base is forced home, as well as the one who scored the home run, making three runs for that inning. The runs should be scored as made, to guard against confusion and argument.—Contributed by Walter Talley, Pottsville, Pa.

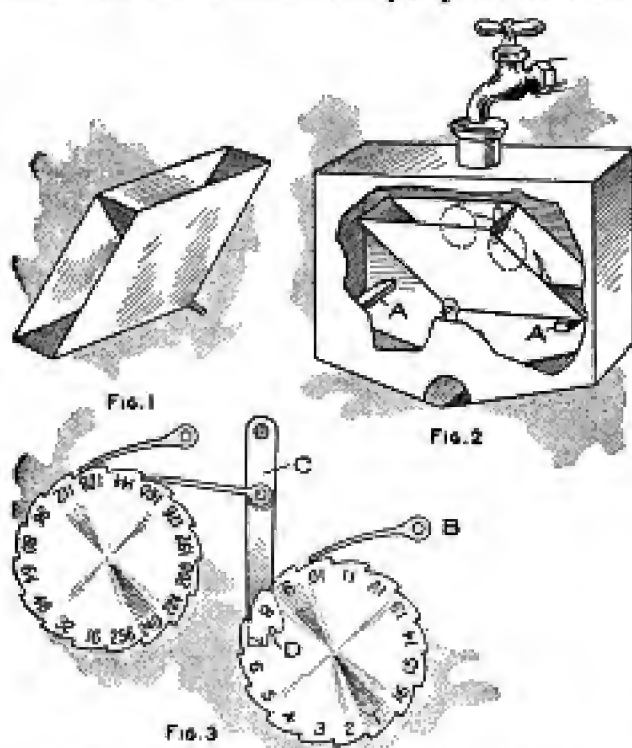
A Staple Puller

With nothing but ordinary tools the removing of staples is tedious and difficult work. If a suitable-sized wire nail is bent like a fishhook and the hook part driven under the staple, the latter can be easily pulled out by grasping and pulling the nail with a hammer in the usual way.—Contributed by R. Neland, Minneapolis, Minn.



Homemade Water Meter

Where it is necessary to measure water in large quantities the meter illustrated will serve the purpose as well



When a Bucket is Filled to the Proper Amount It is Turned Out by the Weight

as an expensive one, and can be made cheaply. The vessel, or bucket, for measuring the water is made diamond-shaped, as shown in Fig. 1, with a partition in the center to make two pockets of a triangular shape, each holding 2 qt., or any amount of sufficient size to take care of the flow of water.

The part forming the pockets is swung on an axis fastened to the lower part, which engages into bearings fastened to the sides of the casing, as shown in Fig. 2. Stops, A, are placed in the casing at the right places for each pocket to spill when exactly 2 qt. of water has run into it. It is obvious that when one pocket is filled, the weight will tip it over and bring the other one up under the flow of water.

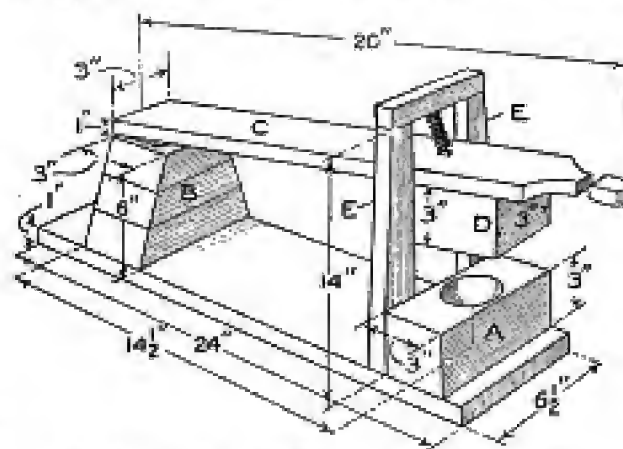
The registering device consists of one or more wheels worked with pawls and ratchets, the first wheel being turned a notch at a time by the pawl B, Fig. 3. If each pocket holds 2 qt., the wheel is marked as shown, as each

pocket must discharge to cause the wheel to turn one notch. The second wheel is worked by the lever and pawl C, which is driven with a pin D located in the first wheel. Any number of wheels can be made to turn in a like manner.—Contributed by F. A. Porter, Oderville, Utah.

A Snowball Maker

Snowball making is slow when carried on by hand, and where a thrower is employed in a snow fort it becomes necessary to have a number of assistants in making the snowballs. The time of making these balls can be greatly reduced by the use of the snowball maker shown in the illustration.

The base consists of a board, 24 in. long, 6½ in. wide, and 1 in. thick. A block of wood, A, is hollowed out in the center to make a depression in the shape of a hemisphere, 2½ in. in diameter and 1¼ in. deep. This block is nailed to the base about 1 in. from one end. To make the dimensions come out right, fasten a block, B, 6 in. high, made of one or more pieces, at the other end of the base with its back edge 14½ in. from the center of the hemispherical depression. On top of this block a lever, C, 20 in. long is hinged. Another block, D, is made



A Device for Making Snowballs Quickly and Perfectly Spherical in Shape

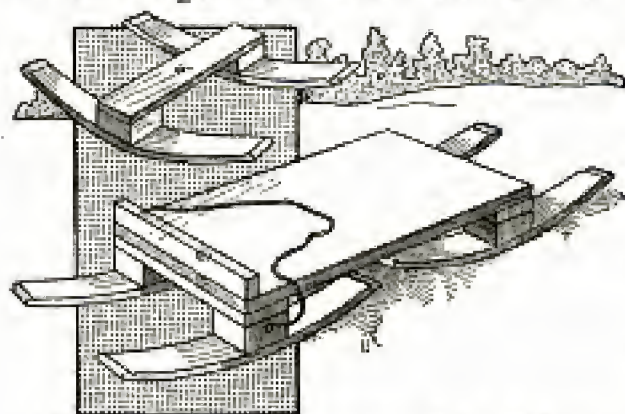
with a hemispherical depression like the block A, and fastened to the under side of the lever, so that the depressions in both blocks will coincide. The lever end is shaped into a handle.

Two uprights, E, are fastened to the back side of the block A as guides for the lever C. A piece is fastened across their tops, and a spring is attached between it and the lever. A curtain-roller spring will be suitable.

In making the balls a bunch of snow is thrown into the lower depression and the lever brought down with considerable force.—Contributed by Abbott W. France, Chester, Pa.

An Inexpensive Bobsled

Any boy who can drive a nail and bore a hole can have a bobsled on short notice. The materials necessary are four good, solid barrel staves; four blocks of wood, 4 in. long, 4 in. wide, and 2 in. thick; two pieces, 12 in. long, 4 in. wide, and 1 in. thick; one piece, 12 in. long, 2 in. wide, and $1\frac{3}{4}$ in.



A Bobsled of Simple Construction Using Ordinary Barrel Staves for the Runners

thick; and a good board, 4 ft. long, 12 in. wide, and 1 in. thick.

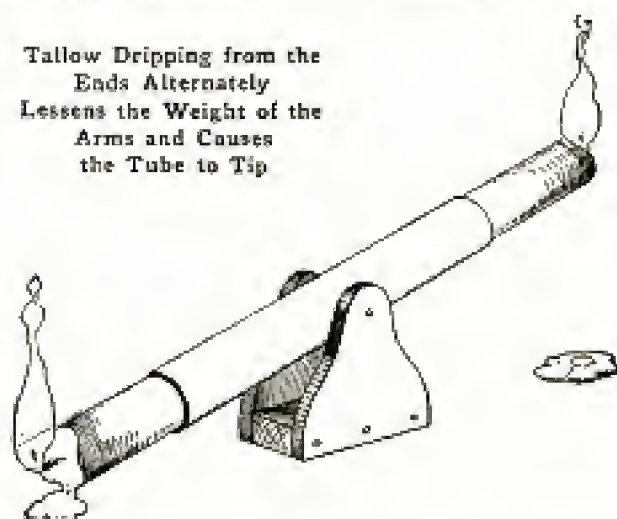
The crosspieces and knees are made with the blocks and the 1-in. pieces, 12 in. long, as shown; to which the staves are nailed for runners. One of these pieces with the runners is fastened to one end of the board, the other is attached with a bolt in the center. The $1\frac{3}{4}$ by 2-in. piece, 12 in. long, is fastened across the top of the board at the front end. A rope fastened to the knees of the front runners provides a means of steering the sled.

The sled can be quickly made, and it will serve the purpose well when an expensive one cannot be had.—Contributed by H. J. Blacklidge, San Rafael, Cal.

Motor Made of Candles

A tube of tin, or cardboard, having an inside diameter to receive a candle snugly, is hung on an axle in the center

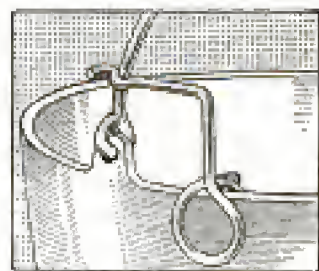
Tallow Dripping from the Ends Alternately Lessens the Weight of the Arms and Causes the Tube to Tip



that turns in bearings made of wood. The construction of the bearings is simple, and they can be made from three pieces of wood as shown. The tube should be well balanced. Pieces of candle are then inserted in the ends, also well balanced. If one is heavier than the other, light it and allow the tallow to run off until it rises; then light the other end. The alternate dripping from the candles will cause the tube to tip back and forth like a walking beam. It will keep going automatically until the candles are entirely consumed.—Contributed by Geo. Jaques, Chicago.

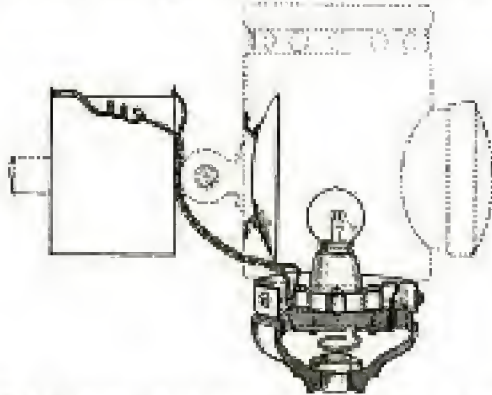
Kettle-Handle Support

The handle of a kettle lying on the kettle rim will become so hot that it cannot be held in the bare hand. To keep the handle fairly cool it must be supported in an upright position. To do this, form a piece of spring wire in the shape shown, and slip it over the kettle rim. The shape of the extending end will hold the handle upright and away from the heat.



Bicycle Oil Lamp Changed to Electric Light

The desire for an electric light for my bicycle caused me to change a fine oil lamp, too good to be thrown away,



A Push Button with Socket and Miniature Globe Used in an Oil Lamp for Electric Light

so that an electric globe could be used in it. The oil cup of the lamp was removed, and a wood push button fastened in its place with three screws. Before fastening the push button, a porcelain socket was attached to its bottom, and connections were made be-

tween socket and push button, ends being left protruding for connection to the battery. A small flash-light battery was fastened to the lamp bracket. A small rubber washer was placed between the head of the push button on the switch and the cap, so that in screwing the cap up, a permanent connection was made. The lamp can be used as a lantern when removed from the bicycle.—Contributed by Lee Baker, Chicago.

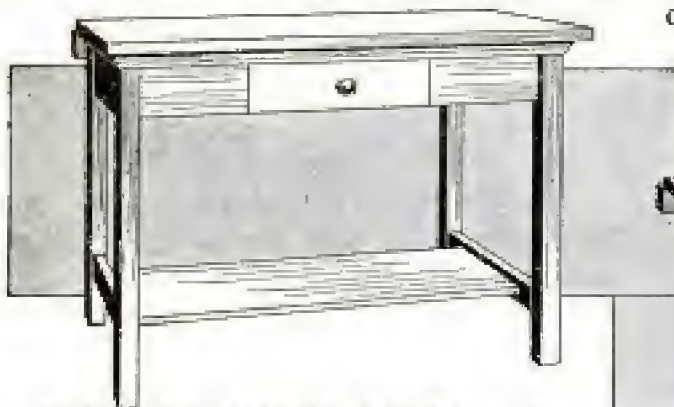
Lifter for Removing Eggs from Hot Water

An improvement over the customary way of removing eggs from hot water with a tablespoon, is to use an old-fashioned coffee strainer. This brings up the eggs without carrying hot water with them.—Contributed by L. E. Turner, New York, N. Y.

Genuine oxalic acid may be used for removing stains from all woods except mahogany.

Double Top for a Table

The need of two tables in a kitchen where there was space for only one,



An Extra Top Covers the Table When It is Placed against the Wall

was the cause of devising the arrangement shown in the illustration. An ordinary kitchen table was mounted on trunk casters or domes so that it could be moved easily, whereupon a zinc top was put on it with raised edges. The table was then placed against the wall where it was to be

used, and an extra, plain top fitted to it and hinged to the wall.

When it was desired to wash dishes on the zinc top, the table was pulled out without disturbing the articles on the hinged top. After drying the dishes, they are removed from the zinc top to the hinged part, and the



The Table When Drawn Out Uncovers the Zinc Tray, Fastened on Top

table is pushed back against the wall.—Contributed by Louis Drummond, Philadelphia, Pa.

Electric Heating Apparatus for the Home

By ARTHUR MOORE

PART XII—Electrically Heated Fireless Cooker

THE cooker illustrated differs from the ordinary fireless cooker in the method employed to supply the necessary heat. The heat is supplied to the ordinary cooker with a plate or dish heated on an ordinary stove, and then placed in the bottom of the cooking compartment. The construction of the cooker illustrated is such that practically all the heat is confined in the cooking compartment, and, as a result, the total amount of heat required is a great deal less than would be required

if the same operation were performed on the kitchen stove. The heat is produced by means of an electric current, which flows through a resistance, located directly beneath the bottom of the inner, or cooking, compartment and insulated therefrom. The amount of heat supplied will depend on the rate at which it is being supplied and the duration of the time of supply. The efficiency of the cooker will depend upon the degree to which the heat is confined in the cooking compartment after it is once generated by the electric current. The circuit is not closed continuously, but only for a sufficient length of time to produce the required amount of heat, which can be best determined by experience. The time the circuit is closed may be controlled by a time switch, in which case the cooker will need no attention after the articles have been placed in the cooking compartment, the circuit closed, and the

time switch set to open the circuit after a certain time. Time switches which will perform the above operation may be purchased cheaply and will pay for themselves in a short time in the increased degree of satisfaction obtained in using the cooker.

The cooker really consists of two distinct parts, namely, the box of the cooker, and the heating element. In Fig. 1 is shown the general arrangement of the various parts in cross section. The box of the cooker is nothing

more nor less than a special form of ice box having the walls lined with a material that is not affected by heat nor likely to catch fire. The wall of the inner compartment is made from a good quality of heavy tin, formed into a cylinder, 9 in. in diameter and $8\frac{1}{2}$ in. long. A bottom is attached to one end by crimping the edges of both bottom and cylinder together tightly, so as to make a water-tight joint without using solder, as solder will melt

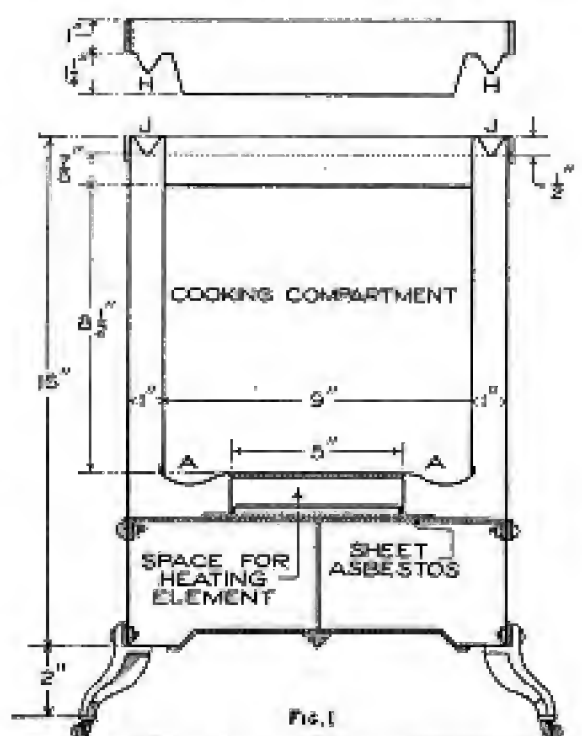


FIG. 1
Cross Section of the Cooker, Showing the Location of the Various Parts, with Dimensions

out. This work can be done by a tinner, who has tools for the work, and before crimping the edges of the bottom and cylinder, a groove should be formed in the disk, as shown at A, for catching any liquid that may collect, and keeping it away from the surface just over the heating element.

Cut from heavy tin a piece having the form and dimensions given in Fig. 2. Bend all four sides up at right angles along the dotted lines B, and then down along the dotted lines C,

also at right angles. Next bend the four sides down, but not at right angles, along the dotted lines D; up, on the dotted lines E; down, on the lines F, and lastly, down, on the lines G.

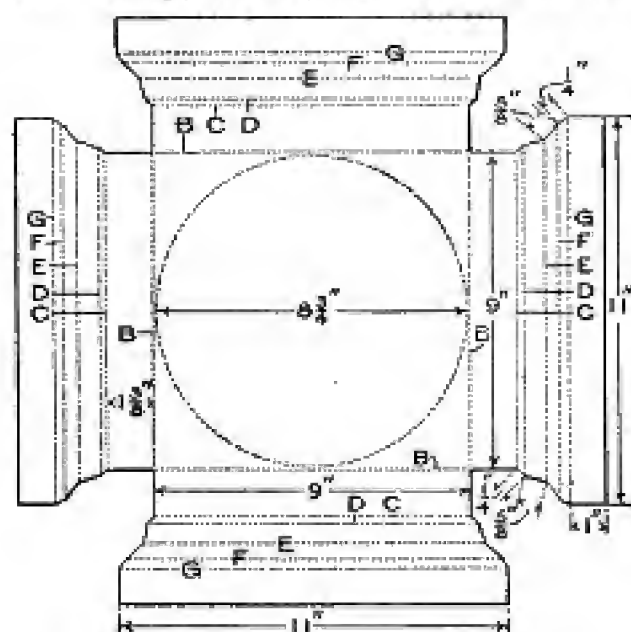


FIG. 2

Manner of Cutting Out the Metal to Form the Top Part of the Cooker

When the four corners are properly cut and the bends properly made, the edges will fit together and make a neat seam. These seams may all be soldered on the under side. A cross section showing the form of the edge when complete is given in Fig. 3. A circular opening is cut in the center of the piece, as indicated. The edge of this opening is turned down so that it will fit snugly in the upper end of the cylindrical vessel first constructed. These two pieces are then soldered together by applying solder from the outside. When through soldering any of the joints, always be sure to remove any trace of soldering flux so as to prevent the possibility of rust, which would soon make a hole in the metal and render the cooker worthless.

The dimensions of the piece forming the under side of the cover are given in Fig. 4. This part of the cover is formed from a piece of heavy tin, with the four edges bent along the dotted lines so that it will have the form shown at the top of Fig. 1. The four corner seams may be soldered on the inside, after the cover is formed so that

it will fit the top on the cylindrical vessel. This piece, or cover, is hinged to the upper portion of the cooker along one edge, and when the cover is raised, the projecting portions H will not rise directly out of the grooves J, but will have a slight side movement, and for this reason they should not fit too tightly.

The outer portion of the cooker is made from sheet iron, such as is used in stovepipes, or galvanized iron will do. The dimensions of the piece for the top of the cover are given in Fig. 5. The four edges are bent down on the dotted lines. This piece, when completed, fits inside of the four edges of the under side of the cover. A rectangle is formed from $\frac{1}{8}$ in. by 1-in. strap iron to fit the outside of the cover. The ends of the piece forming the rectangle may overlap a short distance, and are fastened together with several small rivets. This rectangle must be fastened in place around the outer edge of the cover by means of small round-head bolts, placing at least six of them, evenly spaced, on each of the four edges. The holes for these bolts are drilled while the rectangle is in position, and their positions marked so that it can be taken out and replaced properly. After the holes are all drilled,

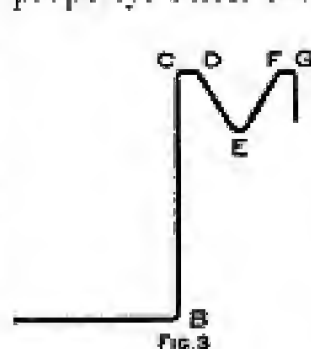


FIG. 3

solder the nuts for the bolts on the inside of the upper portion of the cover, which is inside the tin, their positions being determined by the holes. Fill the space between the upper and lower portions of the cover with asbestos wool, and fasten the cover together by means of the bolts. The appearance will be improved, if the bolts have round heads.

The dimensions and form of the piece for the lower portion of the cooker are given in Fig. 6. Bend the piece along the four vertical dotted lines, and fasten the two edges together by means of an ordinary lap

seam. Bend the four lower projecting portions in, on top of each other, along the horizontal dotted line. Mark out a circle, 7 in. in diameter, on the bottom of the box thus formed, making sure the center of the circle is in the center of the bottom, and cut out the metal inside of the circle. Be sure that the four vertical corners of the box are at right angles, then fasten the four corners of the inwardly projecting pieces with small rivets.

Form three rectangles, from $\frac{1}{8}$ -in. by 1-in. strap iron, that will fit snugly on the outside of the box. The ends of these pieces forming the rectangles are made to overlap and are riveted. The appearance will be improved if all joints in the rectangles are on one side and in line, say, in the center of the side that forms the back of the cooker.

Place the tin cylindrical vessel inside of the sheet-iron box, with the edges of its top outside of the edge of the sheet-iron box, and slip one of the rectangles over it with its upper edge even with the upper edge of the box. Drill six holes in each side of the

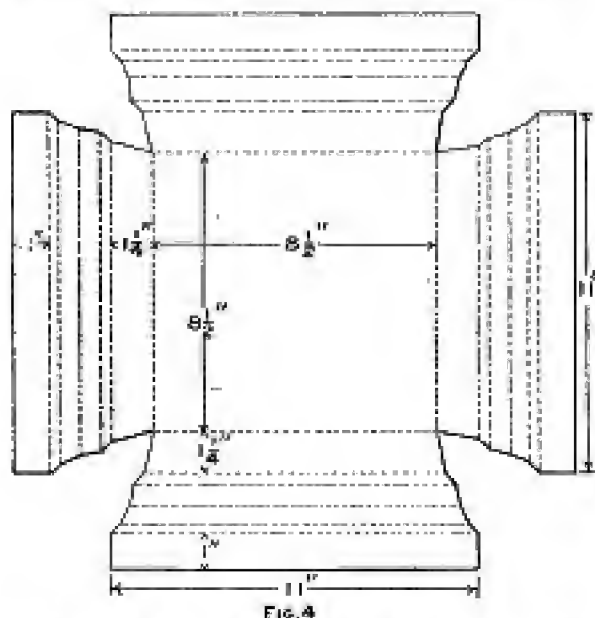


Fig. 4
The Under Part of the Cover is Cut Out the Same as the Cooker Top

rectangle through the tin and the sheet iron. These holes are located directly beneath those that are drilled in the edge of the cover so that all the bolt heads will be in line vertically. Solder

the nuts for the bolts on the inside of the sheet-iron box, using a small portion of solder, so as not to plug up the hole in the nut.

A second rectangle is then fastened

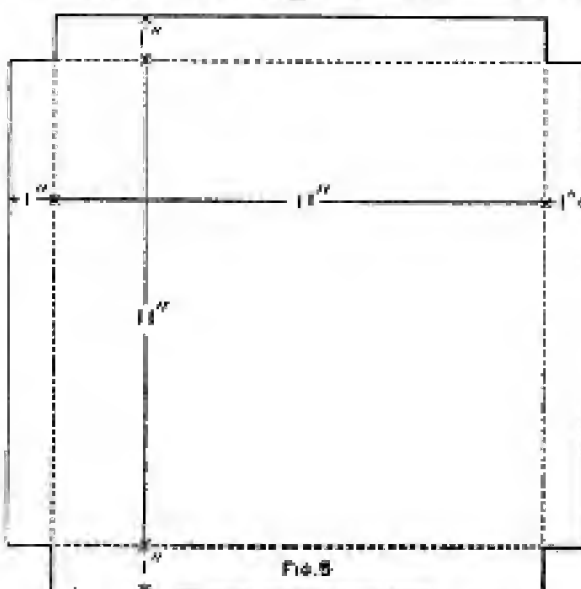


Fig. 5
The Upper Part of the Cover is Cut Out to Make a Flat Surface

around the lower edge of the sheet-iron box with bolts on each side. The position of the third rectangle will depend on the dimensions of the heating element, and it should be put on the box before both rectangles, but not fastened until the heating element is in place.

In constructing this cooker, it is suggested that the builder purchase an ordinary 6-in. disk electric stove rather than make one. One of about 600 watts to operate on the available voltage will do the heating nicely.

The legs, switch, and connecting terminals are carefully removed, and extensions made to the leads so that they are about 10 in. long, and thoroughly insulated with material not affected by heat.

Place the heating element in position, as shown in Fig. 1. Obtain a piece of heavy sheet asbestos, a little larger than the outside dimensions of the bottom of the heating element, and place it in position, as shown. Procure three pieces of strap iron, 13 in. long, 1 in. wide, and $\frac{1}{8}$ in. thick, and bend the ends over at right angles to the main portion, so that they will fit in-

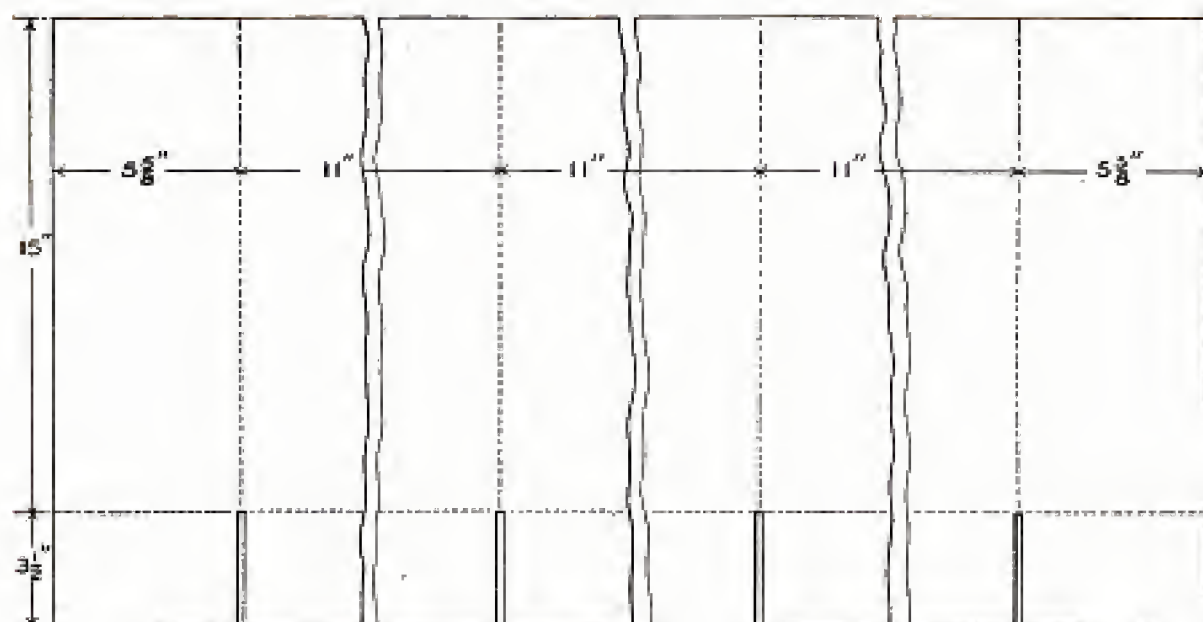


Fig. 6

The Main Outside Body of the Cooker is Made of One Piece of Sheet Metal, with a Portion Cut So That the Projections can be Turned Under to Form the Bottom.

side the sheet-iron box and serve as a support for the heating element. The loose rectangle, outside of the sheet-iron box, is now fastened in position so that some of the bolts used in fastening it may also serve to fasten the three crosspieces. A small rod is fastened in the center of the middle crosspiece, which is to be used in holding the bottom of the cooker in place.

The connecting terminals and switch,

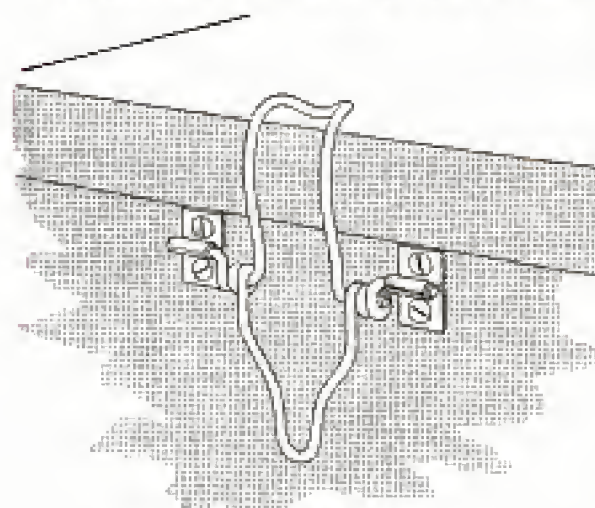


Fig. 7

Two Heavy Wires are Bent to Make a Clip That will Draw the Cover Down Tightly

which were removed from the stove, are mounted on one side of the sheet-iron box, and the necessary electrical

connection made between them and the heating element. A bottom for the cooker is made from a heavy pie pan, fastened as shown. Four legs provided with casters are attached to the corners of the cooker, so that it will be raised at least 3 in. above the surface upon which it is placed.

After all the mechanical work is completed on the lower portion of the cooker, the space between the walls and around the heating-element compartment is filled with asbestos wool. Care should be taken to see that the bottom of the cooking compartment is in contact with the top of the heating element, as any air space between them will greatly reduce the efficiency of the cooker.

A short piece of chain is attached to the cover and main portion of the cooker, to prevent the cover from falling back more than 45 deg. to the vertical. The cover should be held firmly against the upper edge of the cooking compartment to prevent the escape of any heat. A fastener that will serve very well for this purpose is made as shown in Fig. 7. A water seal will be formed around the top of the cooker when enough steam condenses to partly fill the groove J, Fig. 3, in the upper edge.

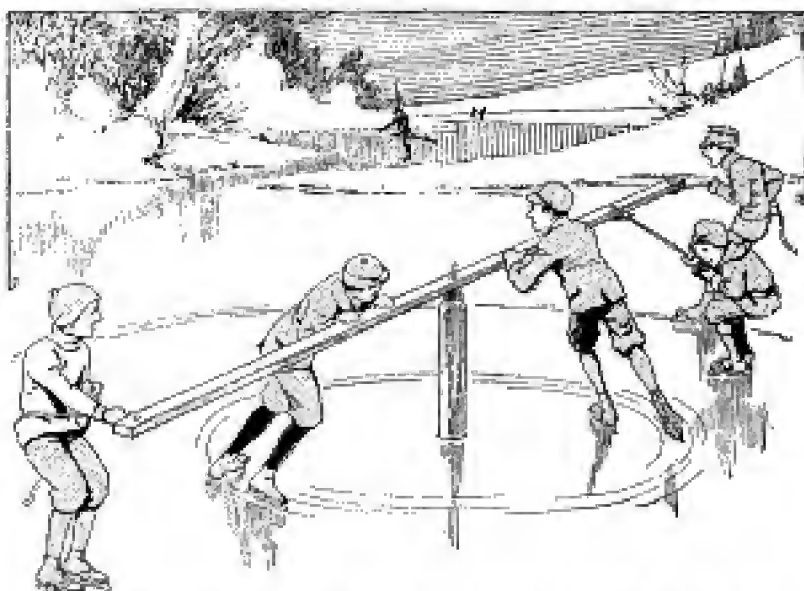
Skating Merry-Go-Round

By HENRY BURICH

After once making and using the ice merry-go-round as illustrated, no pond will be complete unless it has one or more of these devices. To construct an amusement device of this kind, select a good pole that will reach to the bottom of the pond. The measurement can be obtained by cutting a hole in the ice at the desired place and dropping in a line weighted on one end. A sufficient length of the pole should be driven into the bottom of the pond to make it solid and allow the upper end to project above the surface of the ice at least 4 feet.

A turning crosspiece for the upper end of the pole is made as follows: First prepare the end of the pole by sawing it off level, then cutting off the bark and making it round for a metal ring which should be driven on tightly. A pin, about $\frac{3}{4}$ in. in diameter, is then driven into a hole bored in the end of the pole. The crosspiece is made of 2 by

6-in. material, at least 18 ft. long. A hole is bored in the center to receive the pin in the pole end.



Skaters Holding the Rope Ends are Drawn Around in a Circle Rapidly by the Revolving Crosspiece, Turned near the Center by Other Skaters

The crosspiece is easily pushed around the pole and the faster it goes the closer to the center the pushers can travel. Ropes can be tied to the ends of the crosspiece for the skaters to hold on to as they are propelled around in a circle.

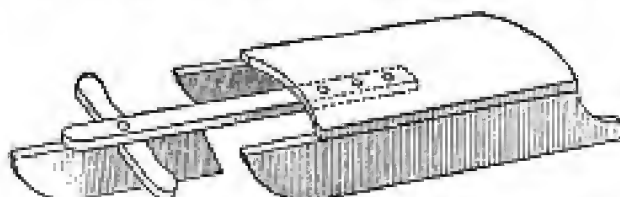
Relieving Air Pressure When Closing Record Boxes

The ordinary pasteboard boxes for holding phonograph records are very hard to close, due to the air pressure on the inside. I overcome this difficulty by making three small holes in the cover with a pin.—Contributed by Robert Bandul, New Orleans, La.

A Steering Sled

An ordinary hand sled can be easily converted into a sled that can be guided like a bobsled by the addition of one extra runner. To attach this runner, a piece of wood is fastened to the under side and in the center at the

front end of the sled top. A runner with a crosspiece on top is pivoted to the extending wood piece, which should be of a length to make the position comfortable when the coaster, sitting on the sled top, has his feet on the ends of the crosspiece. Careful



The Extra Runner in Front is Pivoted, and When Turned, Guides the Sled

measurements should be made to have the lower edge of the runner on a level with or a little lower than the sled runners.

INTERESTING NEW PATENTS

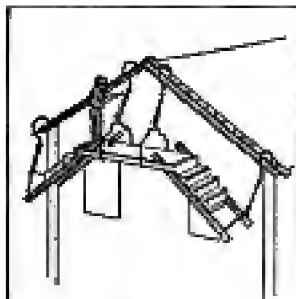


Fig. 1

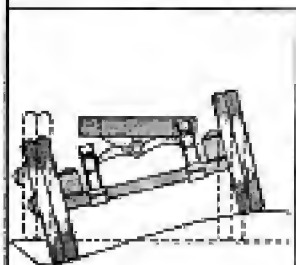


Fig. 2

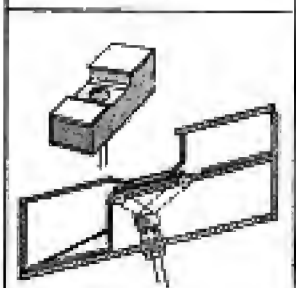


Fig. 3

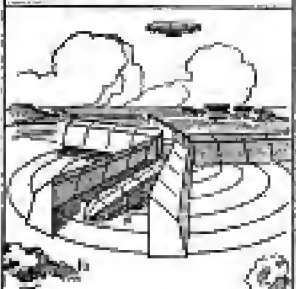


Fig. 4

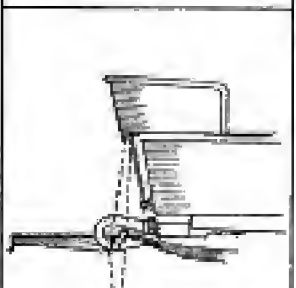


Fig. 5

SWINGING SCAFFOLD (Fig. 1)—This scaffold may be used as a flat platform or as a center platform with steps at the ends. The side pieces of the end sections are hinged to the center section and can be dropped to any angle, while the folding floors of the end sections are easily arranged in the form of steps, as shown.

TRAY-HOLDING ATTACHMENT FOR BED-STEAD (Fig. 2)—The arms that support the tray holders are pivoted to knuckles that are supported on a vertical rod clamped to the headpost. These knuckles are fixed by setscrews at the proper height for swinging the tray holders over the bed, or may be lowered so the tray holders, when not in use, swing under the bed.

EQUALIZER FOR LOAD ON VEHICLE WHEELS (Fig. 3; British patent)—The purpose of this invention is to permit the wheels to adjust themselves to uneven ground without strain on the frame of the vehicle. The body of the vehicle is rigidly fixed to the rear axle, but has a pivotal connection with the front axle, as shown.

ANTISLIPPING DEVICE FOR SHOES (Fig. 4)—This device consists simply of a chain armor placed under the sole of the shoe, and equipped with means for holding it securely in place. The leather front piece slips over the toe of the shoe, and the heel is secured by a strap that fastens over the instep.

ROUTE INDICATOR (Fig. 5; British patent to a German)—The route map used in this indicator is in the form of cards and shows the road as a continuous line with gradients at one side. The mechanism works in accordance with the distance traveled by the car, and automatically advances the cards in succession from the chamber at the right, past the viewing position at the center, to a storage chamber at the left.

ELECTRIC RAT TRAP (Fig. 6)—The bait trough is at the center and can only be approached over one of the trapdoors, which are pivoted at the trough end and are held in horizontal position by a light spring. An electric current from a battery passes through the trapdoor to the platform at the side of the trap when these are in contact. When the rat has advanced far enough on the trapdoor to spring is down and break the contact, this current passes through the body of the rat, the idea being to stun the rat so that it will fall through the trapdoor into the water tank.

PIVOTED AIRSHIP SHELTER (Fig. 7; British patent to a German)—This shelter is divided longitudinally so that the halves can be swung apart to receive an airship and then swung together to inclose it. One end of each section is pivoted while the other end swings on a circular track. Between the sections is a floor that swings in the same manner as the two sections of the shelter.

SCULLING OAR OPERATED BY ENGINE (Fig. 8; American patent to an Australian)—The oar projects through the stern of the boat above the water line and is mounted on a universal fulcrum that gives it the necessary motions for sculling. Placed around the oar is a rolling shutter that is actuated by a spring, so that it moves with the oar and keeps the opening in the stern of the boat closed.

BAGGAGE RACK FOR MOTOR CARS (Fig. 9)—This rack is pivoted to the hangers of the rear springs of the car, and is easily adjusted to a horizontal or vertical position. It is secured in the horizontal position by a stirrup, as shown. When raised, it furnishes a step for reaching the rear part of the car.

FOOT PADDLE FOR SWIMMING (Fig. 10)—The paddle is pivoted to the frame so that it swings out and catches the water on the backward stroke but lies flat against the ankle when the foot is drawn forward. Stops on the frame prevent the paddle from swinging beyond a position at right angles to the direction of the stroke.

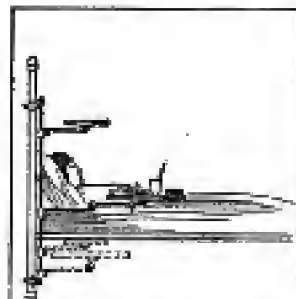


Fig. 6



Fig. 7

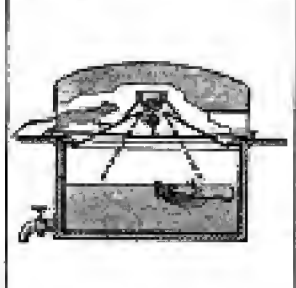


Fig. 8

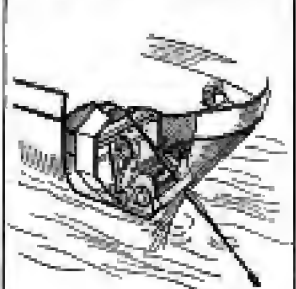


Fig. 9

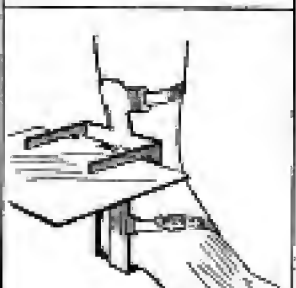


Fig. 10

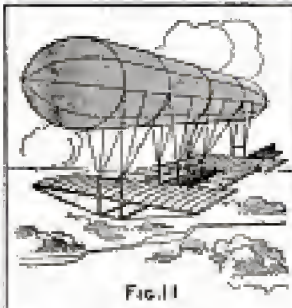


Fig. 11

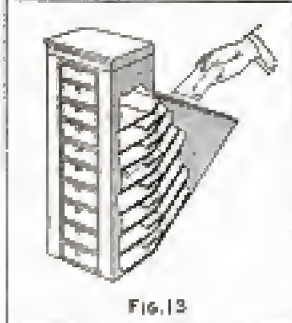


Fig. 12

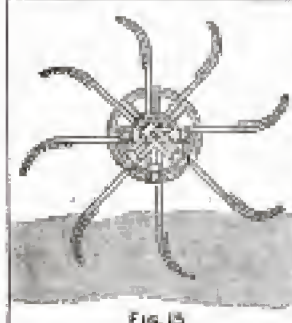


Fig. 13

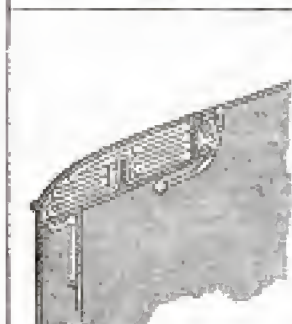


Fig. 14

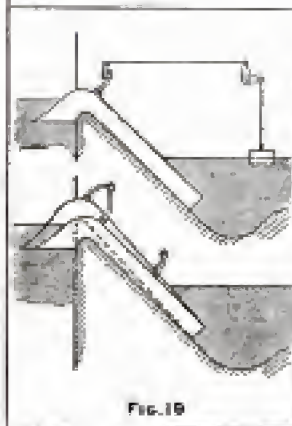


Fig. 15

FLYING MACHINE WITH FLAPPING WINGS (Fig. 11)—This airship is a combination of dirigible and aeroplane and is propelled and partially supported by the movement of the swinging wings at the center of the craft. The end planes are fixed rigidly to the frame, which also supports the cockpit. The swinging wings are hinged to the frame of the cockpit and are swung vertically like wings by the engine. Hinged sections in the wings open on the upward stroke and close on the downward stroke. This combined with the shape of the wings gives both a lifting and propelling effect.

ALARM SIGNAL OPERATED BY VEHICLES (Fig. 12)—A road box extending across the road so that all vehicles must pass over it has a rocking cover which, through a system of levers and pull wires, actuates an alarm bell located some distance ahead. The device is evidently intended to announce the approach of a vehicle at a road crossing or sharp turn in the road.

LETTER-SORTING CABINET (Fig. 13; British patent to a Frenchman)—This device is an auxiliary frame to be used with a letter-sorting cabinet. It consists of a series of inclined chutes each leading to one compartment in the cabinet and each equipped with a ledge at the bottom that deflects the letter to a horizontal position.

ANTISKIDDING DEVICE FOR AUTOMOBILE TIRE (Fig. 14)—This device consists of a pair of chains secured to the sides of the tire, to the elongated links of which are fixed metallic clips that bear against the surface of the road and prevent skidding.

PADDLE WHEEL (Fig. 15; British patent)—This paddle wheel is equipped with an ingenious mechanism by which each arm is lengthened downward as it enters the water and is shortened as it leaves the water. The arms are made in pairs located on opposite sides of the wheel and are joined by a slotted connection that engages the shaft by means of a star wheel. The shifting of each pair for alternately lengthening and shortening the arms is accomplished by rollers working on a fixed cam, as shown.

PARACHUTE (Fig. 16)—The parachute is attached to the body by straps passing around the waist and over the shoulders. The wings as well as the balloon-shaped canopy are ordinarily folded against the body, but unfold automatically and act against the air in case of a fall.

DEVICE FOR RAISING SUNKEN SUBMARINES (Fig. 17; British patent to a Frenchman)—This is a scheme for raising a submarine by means of balloons permanently carried in the gunwales of the vessel. Each balloon is compactly folded in a compartment which is opened by a handle from the inside when the balloon is to be released. Compressed air or gas generated by a chemical such as calcium carbide may be used for inflating the balloon.

LEMON SQUEEZER (Fig. 18)—The handle is drawn up out of the way and the lemon is placed in the open end of the channel. When the handle is pressed down the lemon is cut in two and the juice is squeezed from it and drops into the glass through an opening at the bottom of the channel.

SIPHON CONTROLLED BY FLOAT (Fig. 19; British patent)—The flow of water through the siphon is regulated by the admission of air to the crown, while the admission of the air is controlled by a float located on either level. The idea of the operation of this apparatus is to admit enough air to reduce the flow but not to stop the siphonic action.

SHOE FOR WORKING ON ICE (Fig. 20)—This device consists of a metallic plate attached to the shoe and equipped with prongs under the heel and under the ball of the foot. This is secured in place by straps that pass over the instep and around the ankle.

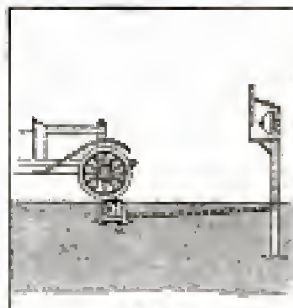


Fig. 16



Fig. 17



Fig. 18



Fig. 19

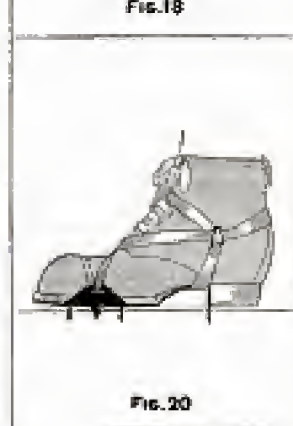


Fig. 20

Thomas J. Earley
5617 Arch St., Phila., Pa.

House plan

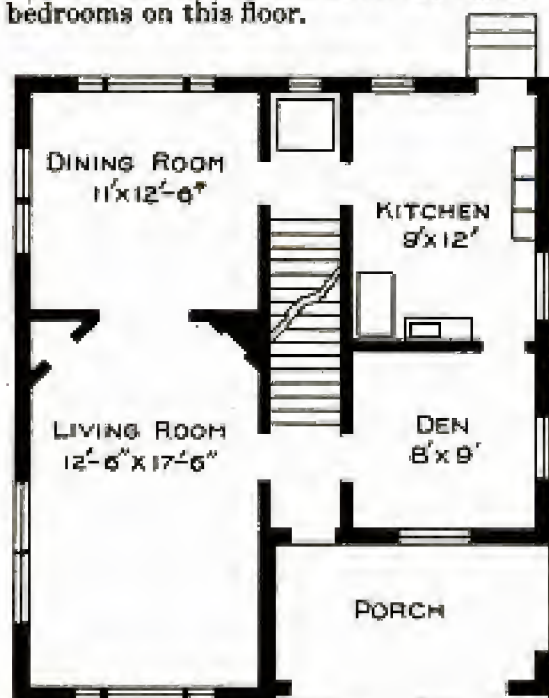
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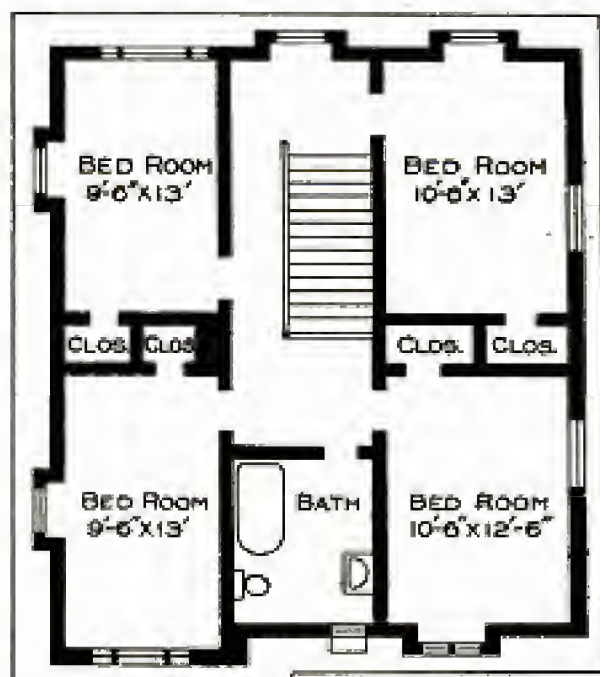
THOS. J. EARLY, ARCHITECT, PHILADELPHIA, PA.

THE remarkable feature about this attractive eight-room house is that it was built and equipped at a cost of only \$2,674. The house is of frame construction, plastered on the outside with cement stucco, and has a shingle roof. The finish is stained white pine. One of the features that made it possible to build so large a house at such a low cost is the gambrel roof, by which a considerable amount of wall construction was saved. As the result of an ingenious arrangement only one chimney is necessary. The smoke pipe from the kitchen stove is carried across under the stairway to the chimney, and the heater in the basement is so located that its smoke vent is carried up beside that of the fireplace and kitchen stove.

The general plan is of a type in which a central hallway runs from the front to the rear of the house, dividing it into two distinct parts, but this type has been modified to allow sufficient width for a stairway only on the first floor. Both the living room and kitchen have direct access to the dining room, while the living room and den are so located with reference to the stairway that no member of the family need be marooned on either floor on account of company being entertained in one of these rooms. The hallway on the second floor has the stairway at one end and the bathroom at the other. Ample closet room is provided for each of the four bedrooms on this floor.



First-Floor Plan



Second-Floor Plan

Dollar-A-Knot

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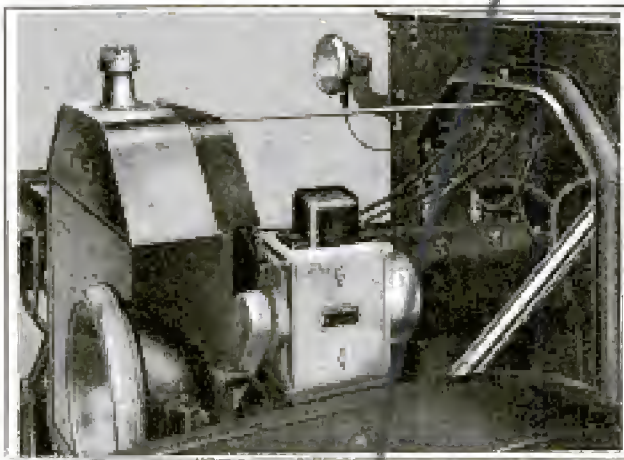
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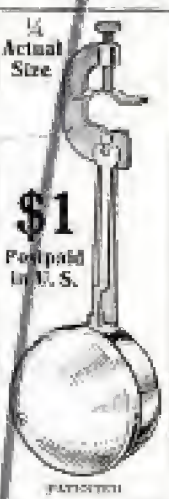
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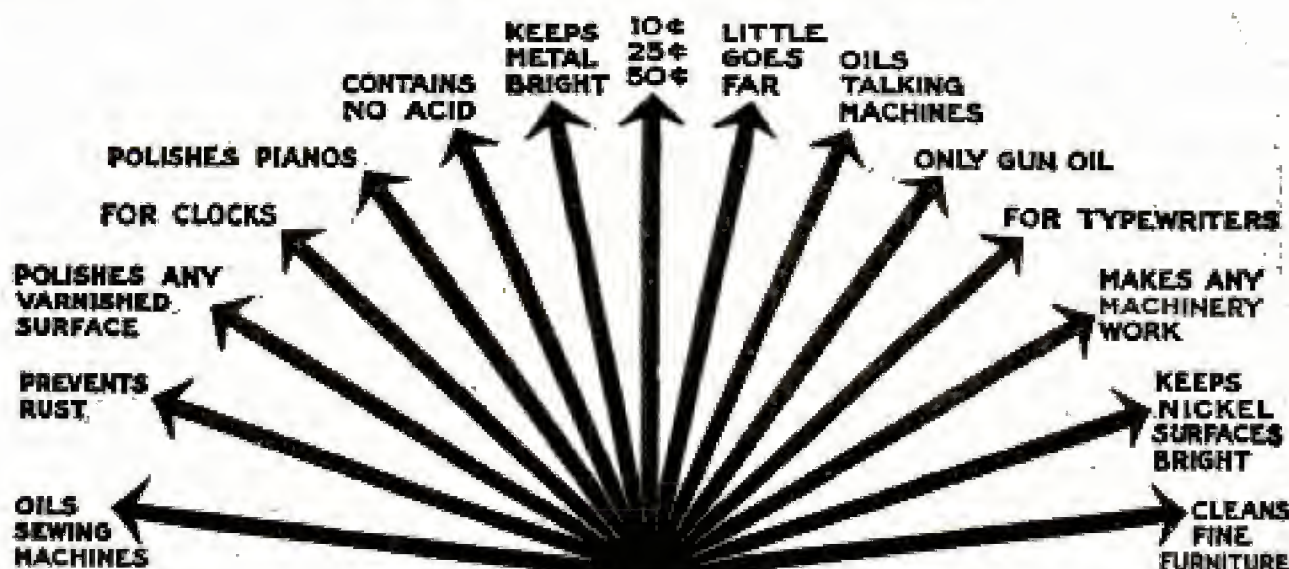
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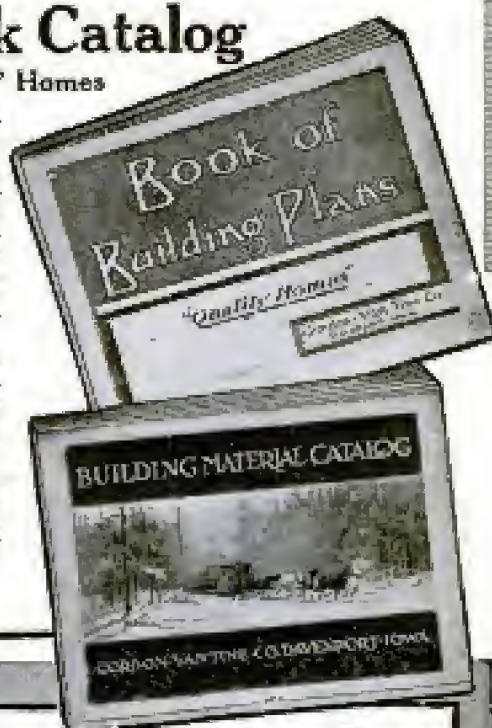
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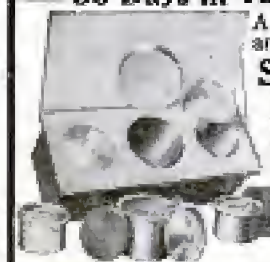
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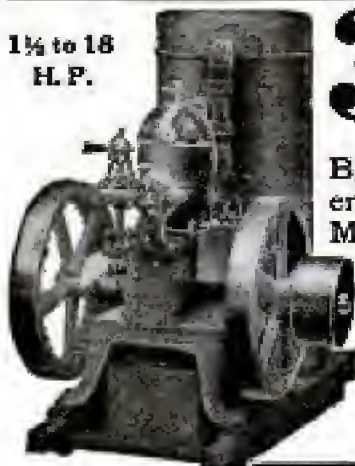
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Craftsman Quality Fabrikoid on Sale by John Wanamaker, Philadelphia; McGreery & Co., Pittsburgh; J. & H. Phillips, Pittsburgh; John Shillito Co., Cincinnati; Stix-Baer-Fuller Co., St. Louis; Du Pont Fabrikoid Co., 681 Broadway, New York.

Red or Black "Vulcan" Ink Pencils
The ONLY perfect, non-leakable ink pencils at moderate prices.

Two Sizes, 4 1/2 and 5 1/2 inches.
Extra Size, 8 inches (black only), \$1.25.
FREE—Liberal supply of ink with each order.
AGENTS WANTED. BIG PROFITS.
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Of making perfect duplicates with the **Dux-Duplex IMPROVED Tip Top Duplicator**. No printer's ink. Always ready. 100 copies first copy written and 50 copies from type-written original. Useful in any business. Here is Two Days' Trial Without Deposit. Complete duplicator, cap size system 8 1/2 x 13 inches. Contains roll of 100 sheets of Dux-Duplex parchment back duplicating surface \$5.00 which can be used over and over again. Circular of larger sizes free on request.

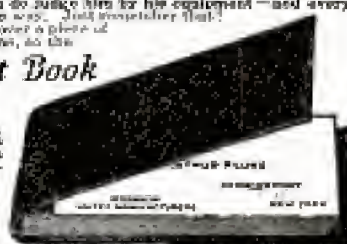
FELIX A. L. BACH DUPLICATOR CO., Dux Building, 111 John St., New York

EQUIPMENT for BUSINESS

WHAT would you think if a man handed you a piece of heavy paper with his name written on it, as his business card? You'd be rather non-plussed wouldn't you? At least you would have a serious doubt as to his desirability as a business connection. In other words his equipment for business does have an effect on you. You do judge him by his equipment—and every man in judging you in the same way. *—(Advertisement for Peerless Patent Book Form Card)*

Peerless Patent Book Form Card

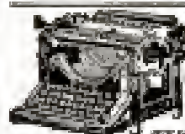
is an advance over the printed, loose card. You need this perfect card in your business equipment—and you need it because it is the best and cheapest. Cheapest because every card can be used—none to throw away because they have become soiled in the pocket or case—none lost. Every card you pay for is available for the use for which it is intended. Send today for a sample of tab and see what the card is, and how it is detached from the book form with a smooth edge. You will be surprised and pleased.



THE JOHN B. WIGGINS COMPANY
Engraving, Die Embossing, Plate Finishing 82-84 East Adams St., Chicago

since 1900. Last year, at the Brooksville station in Florida, an average of 200 lbs. per acre was obtained, while with specially favorable conditions this yield may run up to 450 lbs. per acre.

Of this quantity approximately one-third consisted of tubers for marketing and about one-fourth of tubers too small to be sold probably but, nevertheless, large enough for home use. The bulk of the remainder could be disposed of as feed for cattle and hogs or used for



TYPEWRITERS ALL MAKES

Prices \$15.00 up. **WRITE or DICTATE ANYWHERE at 14 to 25 MANUFACTURERS' PRICES**, allowing **RENTAL TO APPLY ON PRICE**. Free Cash—Installment payments if desired. Write for Catalog 1.

TYPEWRITER-EXPOSURE, 31-33 W. Lake St., Chicago, Ill.



TYPEWRITERS ALL MAKES

Underwoods, Remingtons, Olivetti, Smiths, from \$10 to \$60. Guaranteed 5 years. 500 Typewriters at \$12.50, every one perfect. Write for liberal FREE trial offer at once. All Make Typewriter Exchange Co., 144 N. Dearborn St., Chicago, Ill.



WRITE 600 WORDS WITH ONE DIP

Why use ordinary pens with the never ending dip—when One Dip Pens make every penholder virtually a fountain pen? Agents Wanted. Send 10¢ for Sample Package.

One Dip Pen Co., 34 Daily Record Bldg., Baltimore, Md.



WHITE VALLEY GEMS LOOK LIKE DIAMONDS

Stand acid and fire diamond test. So hard they easily scratch a file and will cut glass. Brilliance guaranteed 25 years. Mounted in 14k solid gold diamond mountings. See them before paying. Will send you any style ring, pin or stud for examination—all charges prepaid. **No money in advance. Money refunded if not satisfactory.** Write today for free catalog.

WHITE VALLEY GEM CO., 701 Wulsin Bldg., Indianapolis

27 Below Zero and a Winter's Coal Bill of Only \$20



Winters don't come much colder than that. That's when the mercury itself begins to seek shelter. That's when the heating apparatus proves itself either a winner or a failure. But when in addition to keeping the house warm and cosy it also knocks "ill" out of coal bills, then indeed it certainly gives real service.

So, read Mr. Petts' letter, reproduced on this page. Did you ever see a longer list of truly winter conditions? Then read on and learn that the winter's coal bill was only \$20—for a seven room house.

Then remember that we can furnish you with over two thousand just such letters telling of more heat and better heat at a greatly reduced outlay, as a direct result of heating the home with a Williamson New-Feed UNDERFEED Furnace or Boiler.



Cut-Out View of
Under-Feed Furnace

The New-Feed UNDERFEED Cuts Coal Bills $\frac{1}{2}$ to $\frac{2}{3}$

This year, even the original UNDERFEED has been improved upon. The New-Feed UNDERFEED requires even less attention, and less effort. If there's a twelve year old boy in the family, he can keep the house warm, and comfortable all the time just as efficiently as a man who tends heaters for a living. The New-Feed is operated from a standing position.

No weary stooping. The wonderful New-Feed principle reduces effort to the minimum. Ashes have to be removed but twice a week.



Cut Coal Bills $\frac{1}{2}$ to $\frac{2}{3}$

The UNDERFEED principle is that of feeding coal from below. Clean, hot coals and fire are always on top in direct contact with most effective radiating surfaces. The fire does not have to lose itself struggling with dead coal, smoke, gas or dirt. There is no smoke, no dirt, soot, cinders or smell. The ashes are fine and white, and few of them. The New-Feed UNDERFEED soon pays for itself in any home, store, church, hall, or

other building. Replaces stoves, grates, or ordinary furnaces or boilers at a great saving. And it burns any size of coal, from soft coal slack and pea, or buckwheat anthracite up.

Also, the New-Feed UNDERFEED is adapted to warm air, steam, or hot water. You will be wise and saving if you investigate the New-Feed before deciding on your new heating system.

We Guarantee 50% Saving in Coal Bills

That is our real guarantee, made where the UNDERFEED is properly installed and operated. Backed by a million dollar company. You take no risk. It has made good for over 30,000 users. It will surely do the same for you. To learn more about this wonderful money-saving system, sign and mail the attached coupon today. It brings you the free book, "From Overfed to UNDERFEED," which fully explains the wonderful method of combustion and just how the New-Feed UNDERFEED operates. No charge. No obligation.

The Williamson Heater Co.

Formerly The Peck-Williamson Co.

25 Fifth Avenue CINCINNATI, OHIO

Read this Letter

Warren, Mo., March 4, 1912

Gentlemen—I installed one of your No. 121 NEW-
FEED furnaces in my seven-room dwelling
here, last December, and since that time has been the
most successful winter for the last ten years, my coal
bill has been smaller than for years. My house
withstands this hot Fall and Winter, and owing to
the severity of the winter, we had to maintain a
greater heat, in order to protect the green grape
plants from freezing, the only heating being put in
just prior to the last week in January, when
the thermometer registered 21 degrees below zero,
and we do not go down 25 to 30 degrees below
for more than two weeks.

In spite of the cold weather, not a bit of the
plaster was frozen. Since we have lived in the
house, the furnace has given us a steady heat, free
from gas and dirt.

Altogether, we are delighted with the furnace,
and would not trade it for any other kind of home
heating, especially an Overfed one. My coal
bill has been about \$20 for this winter, from a
third to one-half less than my overfed furnace is
now in the next room house.

Yours truly, CHARLES PETTS.

Dealers: The New-Feed UNDERFEED has
made a wonderful impression where-
ever introduced. You can make it a winner in
your territory. Write now.

50% Saving Guaranteed

THE WILLIAMSON HEATER CO.

25 Fifth Avenue, Cincinnati, Ohio

Tell me how to cut my coal bills from $\frac{1}{2}$ to $\frac{2}{3}$ with
a Williamson New-Feed UNDERFEED.

Warm Air..... Steam or Hot Water.....
(Mark an x after system interested in)

Name.....

Address.....

My Dealer's Name is.....

2c a Week Pays Wash Bill!

Electricity or Water-Power Does the Work

Write for
FREE Book

Just a "Twist of the Wrist" Starts or Stops the Machine!

The 1900 Motor Washers are now at work in thousands of homes. They are doing the work formerly done by women, at a cost of 2c a week for power! Saving thousands upon thousands of dollars in wash bills. Saving worlds of wash-day troubles. Leaving the women free to do other work while the machines are doing the washing.

The 1900 Motor Washer

1900 Water Motor Washer
Can be connected with
any water tap instantly

Washes a Tubful in Six Minutes!

Handles Heavy Blankets or Dainty Laces

The outfit consists of the famous 1900 Washer with either Electric Motor or Water Motor. You turn on the power as easily as you turn on the light, and back and forth goes the tub, washing the clothes for dear life. Then, turn a lever, and the washer does the wringing. All so simple and easy that it is mere child's play.

A Self-Working Wringer Sent With Every Washer!

The motor runs Washer and Wringer. We guarantee the perfect working of both. No extra charge for Wringer, which is one of the finest made. **Write for FREE BOOK and 30 Days' FREE TRIAL OFFER!** Don't doubt! Don't say it can't be done. The free book proves that it can. But we do not ask you to take our word for it. We offer to send a 1900 Motor Washer on absolute Free Trial for an entire month to any responsible person. Not a cent of security—nor a promise to buy. Just your word that you will give it a test. We even agree to pay the freight, and will take it back if it fails to do all we claim for it. A postal card with your name and address sent to us today will bring you the book free by return mail. All correspondence should be addressed to

Doing the wringing with
1900 Electric Motor Washer



1900 WASHER CO., 6173 Court St., BINGHAMTON, N. Y.

OR, IF YOU LIVE IN CANADA, WRITE TO THE CANADIAN WASHER CO., 385 YONGE ST., TORONTO, CANADA.

(22)

Fun and Health

FOR boys and girls from 5 to 15 years of age. Wonderful new mechanical principle. Speed without labor. Rider propelled by his own weight. No pushing. See it. You can't realize the fun and health in this marvelous little car from a picture. Send for a



Skudder Car

It develops the lungs, shoulders and legs. Children never tire of it. Ball bearing, unbreakable steel frame. It will stand the knocks. Write for free circular and our special trial offer.

SKUDDER CO.

Room 510 Straus Bldg., CHICAGO

seed purposes.

The dashen is a staple article of food for millions of people in tropical and subtropical regions, and there seems to be no reason why it should not prove equally

\$1.00 Down 50c a Week

for this high-grade ring set with 1 ct.

Mexican Diamond



Exactly resembles finest diamond side by side; same rainbow flashes and dazzling brilliancy (guaranteed). Fine 12kt. gold-filled mountings.

We Trust You Send \$1 and we will mail at once (no C.O.D.) either Ladies' or Men's

Ten. Ring, price \$4.95 or Men's Ten's Ten's Ring, price \$6.25, set with finest 1 ct. gem. If O. K. you pay balance 50c a week. Money back, not pleased. Act quickly; offer limited. Catalogue free.

AGENTS WANTED.

MEXICAN DIAMOND IMPORTING CO., Dept. ET-2-T, Las Cruces, N. M.

(Exclusive Controllers of the Genuine Mexican Diamond.)

300 Candle Power of Light

AT A COST OF 1/8c PER HOUR

The Kerosene table lamp has one inverted mantle and **MAKES AND BURNS ITS OWN GAS FROM COMMON KEROSENE OR COAL OIL.** It gives a bright and steady white light **TEN TIMES** as **BRILLIANT** as an ordinary kerosene wick lamp.

The "Quicklit" Gasoline table lamp can be **LIT WITH AN ORDINARY MATCH LIKE CITY GAS.**

Both styles equipped with automatic cleaning needle.

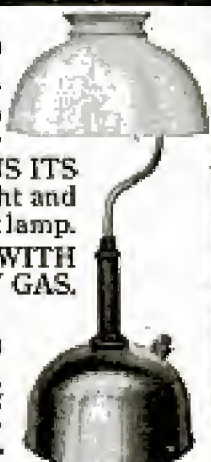
No smoke, no smell, no wicks to trim. A splendid proposition for dealers

LIVE AGENTS WANTED

Write today for further particulars, also complete illustrated catalog describing the above kerosene and gasoline lamps and hollow wire systems.

THE NACEL-CHASE MFG. CO., 144-164 East Erie St., CHICAGO, ILL., U.S.A.

The largest manufacturers of artificial lighting devices in the world.





Collapsible Go-Cart Bargain

No. MH111. New One-Station Collapsible Go-Cart equipped with large foot well and detachable storm front. 2-row adjustable hood and foot well. Instantaneous motion folds cart. All steel construction covered with black "Imperial" leather. Half in. rubber tires. Nickel trimmings and fenders. Adjustable back. Price **\$6.98 75c** Per Month. Greatest value ever offered.



"Regent" Range Bargain

No. MH112. Complete with high closet. Made of best cast iron in very finest manner. Large oven 19x16x11 ins. in size; duplex grates; 6-hole top; oven thermometer; improved flue system and steel high closet. Trimmed in silver nickel. Gas control reservoir. Price, without reservoir, **\$22.78**. Price, with reservoir, **\$27.78**. Price, **\$1.75** Per Month.

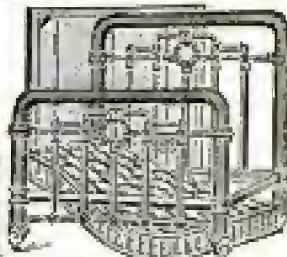
Three-Piece Mission Set Bargain

No. MH109. Solid oak, fumed finish, 3-piece Mission Set. Table 36x21 inches, strongly built; convenient lock shelf at either end. Rocker and Arm Chair made to match; upper and outside panels upholstered with "Imperial" Spanish leather; seat set on 4 springs, expertly filled and up-**\$11.78** holstered. Price **75c** Per Month.



Complete Bed Outfit Bargain

No. MH113. Consisting of 1 1/2-16 in. continuous post iron bed with 2-10 in. slats; 6 1/2 in. high all-metal steel support springs, and cotton top fibre filled mattress. Mattress comes in full size (4 ft. 6 in.) only. Colors: White, Teal, Green or Vanilla Mar-tin. Our price only... **\$9.89 75c** Per Month.



HARTMAN Will Trust You

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We want you to learn, by testing the remarkable get-acquainted offers in this advertisement, how inexpensive, how satisfying and how easy it is to furnish the entire home or secure odd pieces of Furniture, Carpets, Rugs, Silverware, Draperies, etc., etc., from this mammoth Hartman institution where you can buy on easiest credit terms—and have the goods in your own home before you pay. We alone offer to send you, wherever you live, without sending any money with your order, any one of the remarkable bargains shown here—but we can only afford to send one to each family at these prices.

When you get our mammoth catalog, greatest ever published, you can order anything you wish—any amount—any number of articles you desire. Return anything not satisfactory—we will pay the freight both ways.

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We are the originators of the easy payment Credit plan; for 60 years we have extended credit to families everywhere. Our records prove that all housewives are honest, that's why we can give the most liberal credit terms ever made, no matter how small your income—no references required, no embarrassing questions asked, everything strictly confidential, no salesman to bother you, no collectors, no interest to pay, no mortgages, no security asked. Order what you want, make small monthly payments to suit your convenience. Most liberal and most satisfactory plan ever before offered. Millions of homes every where beautifully furnished by Hartman's easy payment plan thoroughly prove every claim we make.

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This is the largest institution of its kind in the world, with a purchasing power of over Ten Million Dollars.



Refrigerator No. MH103. Sanitary Refrigerator. Best cold air circulation, and superior method of insulation works wonders in saving ice. Size: 43 ins. high, 26 1/2 in. wide, 18 1/2 in. deep; large provision chamber, white enamel lined. Splendid drain. Has ice capacity of 15 lbs.

Kitchen Cabinet Bargain

No. MH104. Selected white-painted mahogany. Base has white-wood table top 42x26 in. Sliding breadboard, two utility drawers, 2 sliding 6th. floor bins. Top has two cupboards, glass door, tilting sugar bin, shelf space, price **\$8.73** Monthly utility drawers.



No Reference Is Required

No Money In Advance



Seamless Velvet Rug Bargain

No. MH100. Beautiful Seamless Velvet Rug in an elegant new design, 9x12 ft. Best wearing yarns in a pattern that is sure to please. Rich medallion center and harmonizing border of Tan, Green, Brown, Red and light colorings. A very choice Rug and one from which lasting service can be had. **\$14.75 \$1** Per Month.

Order any one of the items shown in this advertisement. They will prove beyond all argument the true value of the many wonderful bargains in Hartman's Mammoth Catalog.

HARTMAN Furniture and Carpet Co., 3945 Wentworth Ave., Chicago, Ill.



Comfortable Rocker Bargain

No. MH110. A large, comfortable Rocker at a bargain price. Made of solid oak in golden finish in a very choice design. Is upholstered with "Imperial" Spanish brown leather on seat and back. Seat has 4 springs, stuffed with tow and cotton. Front and back posts are handsomely carved. Seat front plaited and back is button tufted. Strong posts and runners. It represents the best rocker value ever offered at the low price of... **\$3.45**



50c Per Month

A serviceable Flannel Shirt with style!

You've always wanted a good flannel shirt that you could wear for work or pleasure—and here it is—the Signal Flannel Shirt. Built for service—and gives it, yet stylish as a shirt for dress-up service. Guaranteed to wear better than any other flannel shirt you've ever had.

Railroad men especially appreciate a good warm shirt—more and more they are buying Signal Flannel Shirts. Everyone who has worn a Signal Shirt is an ardent booster—you will be, too, after you discover the comfort and wear that these shirts give, without sacrificing style.

SIGNAL Flannel Coatshirts

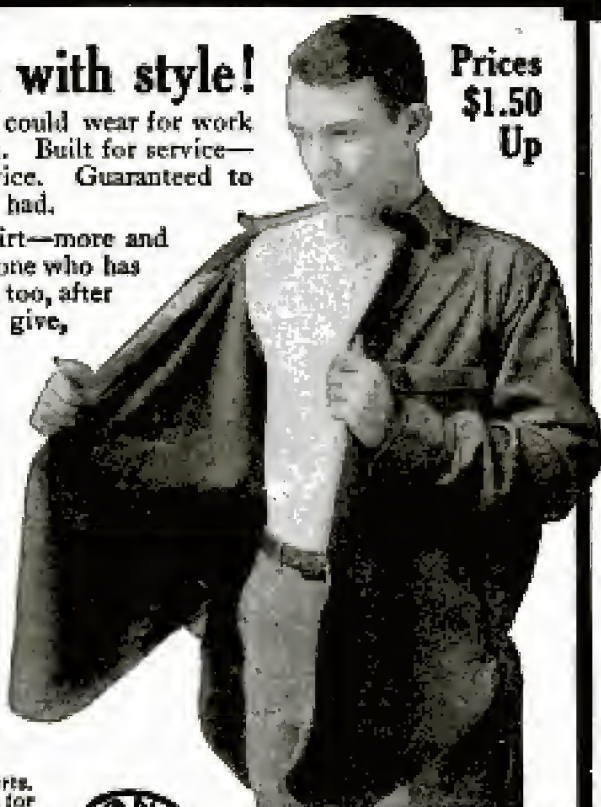
UNION MADE

Wear well—keep their style—last a long while. Big armholes that will never bind, roomy elbows, extra long sleeves, wide cuffs. Snug-fitting, non-irritating military collar that fits comfortably. Three-inch over-lapping flaps in front. Combination watch and handkerchief pocket, with a flap you can button. Extra button at bottom of breast plait to prevent gapping. Prices \$1.50 and up. Signal Flannel Shirts are also made closed style in a large variety of styles and patterns—military, plain or detachable.

You get in Signal Flannel Shirts the same quality, style and service that made Signal Overalls and Workshirts the universal favorites with railroad men.

Flannel Shirt Free Ask your dealer for Signal Flannel Shirts. If he hasn't them, induce him to send for sample swatches, mentioning your name, and with his first order we will include a shirt for you absolutely without charge.

Hilker-Wiechers Mfg. Co. 1254 Mound Av., Racine, Wis.
Manufacturers of the famous Signal Overalls, Coats and Shirts



Prices
\$1.50
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Always look for this trade-mark—it's the "Safety First" sign in buying Shirts and Overalls.

AGENTS \$6 A DAY

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400% to 800% Profit in Popcorn—Crispette and Candy Business

Crowds swarm to buy our Kettle-Popped Popcorn—popped under glass—without salt popping!—GREAT FRUIT-CHES!—FLUFFY KERNELS! Corn pops 25 per cent bigger with the Dellenbarger machine and 300 per cent better product. Our delicious CRISPETTES melt in your mouth. Wonderful new Automatic Crispette Press is a real money-maker! See extra money in detail!

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valuable in the southern and southwestern portions of the United States, as a substitute for or supplement to the potato and sweet potato.

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Be Your
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You need no experience. Our line sells itself. We have the most complete, fully guaranteed, line of knives, razors, strops and cutlery specialties. Golden Rule Knives are hand forged, made of genuine English razor steel. We will put any photo or knives emblem on one side of the transparent handle and name and address on the other. Write for catalog and terms—exclusive territory. Golden Rule Cutlery Co., 552 W. Lake St., Dept. 201, Chicago

OVER 65 YEARS'
EXPERIENCE

PATENTS

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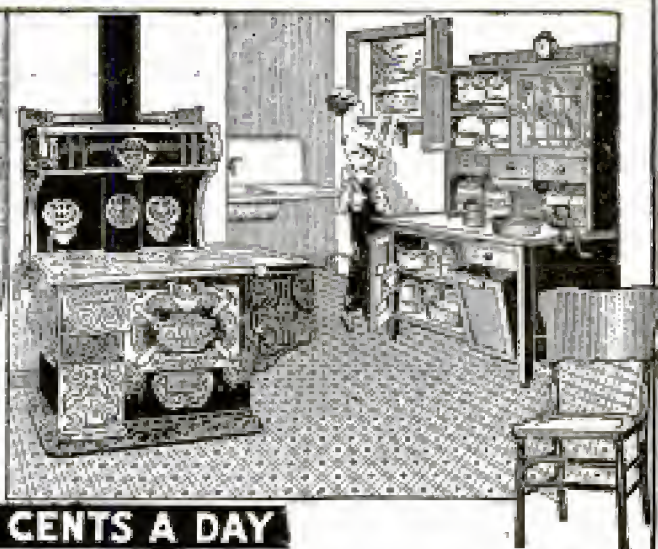
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YOURS FOR 3 CENTS A DAY

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Pretty Homes

All Around You are Furnished Here on Credit

No References

One home in nine, the country over, has a charge account here now. Your neighbors have them. Some of the prettiest homes around you are furnished here on credit.

There is no red tape. When you ask for our catalog we open an account. We send a Credit

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A Year to Pay

We send each article on 30 days' free trial, subject to return. If you like it we charge it to you, allowing a year to pay. Then save up 2 or 3 cents daily. Send us a little each month. And all the time you are using what you pay for.

No contract, no security, no interest, no extra price. It is just as easy as to buy for cash.

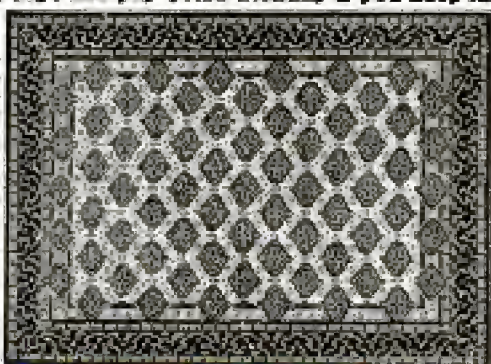
Novel Prices

Our prices will astound you. We buy for the millions so we buy very low. We save you five profits by selling direct. Our prices will average one-third less than stores.

Get This Rich Axminster 9x12 Rug—Send only \$1.25

Order right from this paper to get this handsome bargain. There were not enough to catalog. Try it for 30 days and pay \$1.25 monthly if you keep it.

This Handsome Oriental Design is very rich in tone and will harmonize beautifully with any furniture. The rug is woven in a tan ground and the Oriental figures are brought out in beautiful shades of brown, red, blue, green and old rose colors. Only selected silk-wool yarns are used. Rug is neatly finished and has a luxurious high pile.



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Furniture Draperies—Linens Carpenters' Tools
Carpets—Rugs Refrigerators Chinaware—Clocks
Oilcloths, etc. Silverware Sewing Machines
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Also the books I mark below.

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Write plainly. Give full address. Check which catalogs you want.

Please Mention Popular Mechanics

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10 Days FREE—Send No Money



TWICE THE LIGHT ON HALF THE OIL

We don't ask you to pay us a cent until you have used this wonderful modern light in your own home ten days; then you may return it at our expense if not perfectly satisfied. You can't possibly lose a cent. We want to prove to you that it makes an ordinary oil lamp look like a candle; beats electric, gasoline or acetylene. Lights and is put out like old oil lamp. Tests at 14 leading Universities show that it

Burns 50 Hours on One Gallon common coal oil (kerosene), no odor, smoke or noise, simple, clean, won't explode. Three million people already enjoying this powerful, white, steady light, nearest to sunlight. Guaranteed.

\$1,000.00 REWARD

will be given to the person who shows us an oil lamp equal to the new Aladdin in every way (details of offer given in our circular). Would we dare make such a challenge if there were the slightest doubt as to the merits of the Aladdin? **GET ONE FREE.** We want one user in each locality to whom we can refer customers. To that person we have a special introductory offer to make, under which one lamp is given free. Write quick for our 10-Day Absolutely Free Trial Proposition and learn how to get one FREE.

MANTLE LAMP COMPANY, 374 Aladdin Building, Chicago, Ill.
Largest Manufacturers and Distributors of Kerosene Mantle Lamps in the World

Men with Rigs Make \$100 to \$300 Per Mo. Delivering

the ALADDIN on our easy plan. No previous experience necessary. Practically every farm home and small town home will buy after trying. One farmer who had never sold anything in his life before writes: "I sold 61 lamps the first seven days." Another says: "I disposed of 54 lamps out of 81 calls." Thousands who are active money earners see the Aladdin just as strongly. **No Money Required.** We furnish capital to enable you to get started. Ask for our distributor's plan, and learn how to make big money in unoccupied territory.

Sunshine Lamp 300 Candle Power FREE!

To Try in Your Own Home

Turns night into day. Gives better light than gas, electricity or 11 ordinary lamps at one tenth the cost. For Homes, Stores, Halls, Churches. A child can carry it. Makes its own light from common gasoline. Absolutely SAFE.

COSTS 1 CENT A NIGHT

We want one person in each locality to whom we can refer new customers. Take advantage of our SPECIAL FREE TRIAL OFFER. Agents Wanted.

SUNSHINE SAFETY LAMP CO.
220 Factory Bldg. Kansas City, Mo.



WHITE FLAME

BURNERS make your old kerosene lamps and lanterns give a brilliant white light better than electricity or gas. Doubles your light. Burns all. **NO MANTLE TO BREAK.** Guaranteed Safe and Reliable. Delights every user. Send now for complete sample pamphlet 36 pins, stamps or coin. **FREE!** MONEY BACK IF NOT SATISFACTORY. Live Representatives Wanted. Exclusive Territory.

WHITE FLAME LIGHT CO., 68 Clark Bldg., Grand Rapids, Mich.



SAFETY FIRST Yale Electric Lantern



and Combination Home Lamp, Search and Flash Light. This is NOT a Toy. Turn a switch and you get a flood of light! No refueling, handling, messy smoke all-around light for subway, tunnels, apartments, school, farmer, etc. Eliminates: Flicker, rattles, oil, grease, smoke, odor, trimming of wicks and other troubles. Always ready when needed. **Introductory Price \$3.50.** A sample will be sent by prepaid parcel post on receipt of remittance of introductory price. Under sample mail agents' proposition now for the first. **Sold on money-back guarantee.** A big money-maker for agents. Agents Wanted Everywhere. **YALE MANUFACTURING CO., 21-22 So. Duane St., Chicago**



BEACON BURNER FREE

FITS YOUR OLD LAMP

100 Candle Power Incandescent pure white light from (kerosene) coal oil. Beats either gas or electricity.

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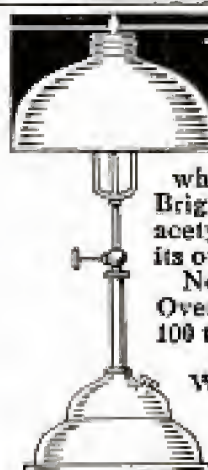
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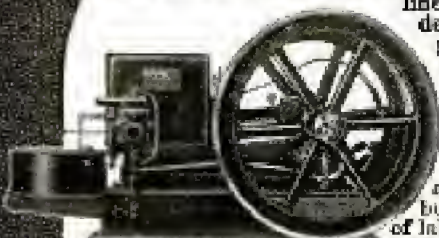
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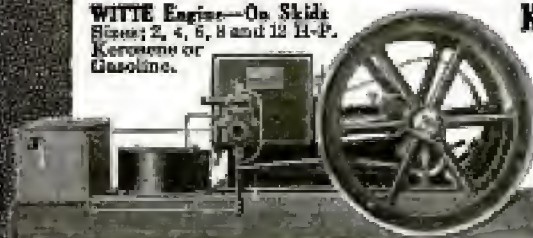


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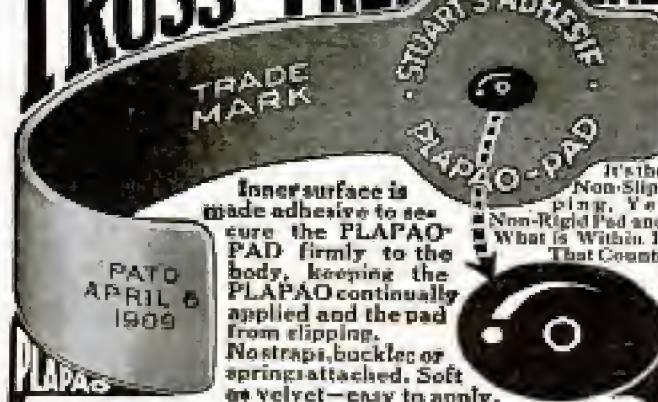
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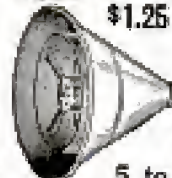
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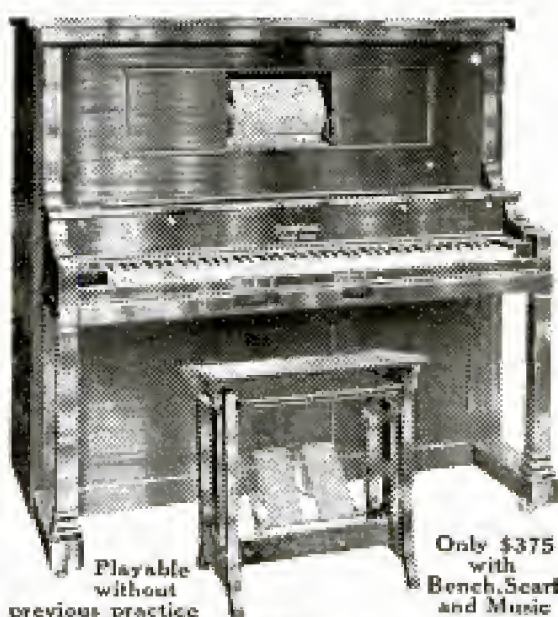
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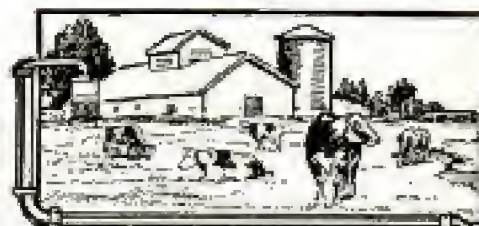
If you have an invention send us a sketch of it for report and ask for the books at the same time.

CHANDLEE & CHANDLEE, 953 F Street, Washington, D. C.

REGISTERED ATTORNEYS

Fresh Water for Stock without effort or expense

It's mighty pleasant to know there's plenty of water for your stock with no tiresome hand pumping or engine troubles ahead of you. That's exactly the situation when you



INSTALL A RIFE RAM ON YOUR FARM

—Any stream having a fall of 3 feet or more and a supply of 3 gallons or more a minute will operate it. Insures a constant, automatic, permanent water supply. No skilled labor required to install. Used with either overhead or air pressure tank. Over 11,000 in daily use. No freezing. No attention. Satisfaction guaranteed.

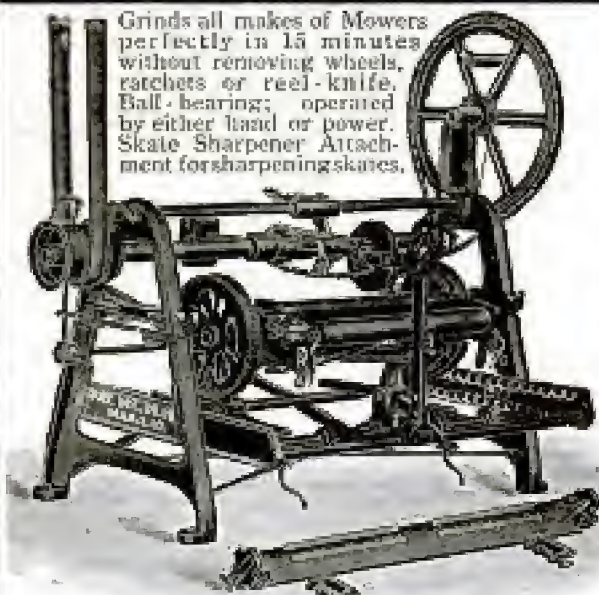
Tell Us Your Water Supply Conditions and we will send free estimate on a Ram for your requirements. Write today for catalog and particulars.

RIFE ENGINE COMPANY, 3131 Trinity Building, NEW YORK CITY



"IDEAL" Lawn Mower Grinder

Grinds all makes of Mowers perfectly in 15 minutes without removing wheels, ratchets or reel-knife. Ball-bearing; operated by either hand or power. Skate Sharpener Attachment for sharpening skates.



"You Grind It As You Find It"

Write Today for full information of this great labor-saver and money-maker. Will do the work so much better, quicker and easier you cannot afford to do without it. The only practical machine for sharpening Lawn Mowers on the market. Over 6000 in use. Fully warranted. Sold on easy-payment terms. Write today. Don't delay.

THE ROOT-NEATH MFG. CO., Plymouth, O.

DO YOU HAVE KNIVES TO GRIND, SILVER TO POLISH, SMALL TOOLS TO OPERATE, WASHING MACHINES OR WRINGERS TO RUN? LET THE RED DEVIL

DO YOUR WORK

Attached to any water faucet will develop up to 3 Horse Power according to size of pipe and water pressure. Only perfect small motor made. Improved bucket wheel construction.

No. 1482—4 in. Motor for Mechanics and Tradesmen. Washing Machine, 3 ft. P., up to 1/2 in. pipe, 60 lbs. water pressure; 1 ft. P., up to 1/2 in. pipe, 100 lbs. water pressure. Net price \$5, cash with order.

No. 1483—4 in. Motor for grinding, polishing, sawing machines; for Dettol, Dentists, Druggists, etc., with every, buffing wheel, silver polish and roller. \$5.

No. 1484—4 in. Motor and pulley only \$3.50, cash with order.

Money back for any reason. Order your motor from dealer or from us. Send your water pressure and size of supply pipe. Active Agents wanted. Catalog free.

Only Motor to do this work



DIVINE WATER MOTOR CO. DEPT. P. UTICA, N.Y.

solid cherry wood. Important places in the map are marked by different kinds of wood contrasting in color. The streets are laid in white holly; city blocks, in mahogany; parks, in tulip wood; cemeteries, in bird's-eye maple; the Mississippi River, and other bodies of water, natural and artificial, are outlined in Circassian walnut; street railways are in red cedar; interurban railway lines, in rosewood; steam railroads, municipal buildings, and bridges being also represented by woods in different col-



CRESCENT WOOD WORKING MACHINES

are high in quality and moderate in price. Send today for catalog of hand saws, jointers, saw tables, planers, swing-saws, shapers, planers and matchers, variety wood workers, Universal wood workers, disk grinders, borers.

The Crescent Machine Co., 93 Columbia St., Linton, O.



SEBASTIAN LATHES HIGH QUALITY LOW PRICES

Do you delight in good tools? Then you will delight in a Sebastian Lathe. We have been building Lathes for 25 years. The big factory at Cincinnati is equipped with modern and most improved machinery, and employs skilled labor only. Nothing is built there but Lathes. Specializing on this one tool together with the larger number manufactured makes Sebastian Lathes

THE STANDARD FOR QUALITY AND LOW IN PRICE

Simple and durable construction makes them accurate and economical. This is proved by many records and voluntary letters, like this one from The Kretschmer Mfg. Co.: "The Lathe we purchased from you 8 months ago is giving us entire satisfaction. We have given it service work in every way that a Lathe is used, without the least deviation from perfect work. Should we have occasion to purchase another Lathe it certainly would be a Sebastian." Our reputation stands back of every Sebastian Lathe. It has got to be as represented or you get your money back. Ask for our new catalog and look over the lines of Lathes for general repair work, garage and automobile work, etc., and when you buy a Lathe—say "Sebastian." Address,

THE SEBASTIAN LATHE COMPANY, 107 Culbert St., CINCINNATI, OHIO



Sebastian 15-inch Lathe

Ideal for auto builder, garage, repair shop and general jobbing shop. Construction, rigid, strong—rapid—accurate. Cuts standard threads with furnished gears from 5 to 50. Greatest machine in the world for small and medium sized work.

A Suggestion to Factory Owners

Send for Booklet
"How
Scotchie
Made
Good."



Start the New Year right by adding to your equipment this little labor and money saving device. No factory should be without one. A

boy can lace a broken belt in 3 minutes with the

"Clipper" Belt Lacer

TRADE MARK LACE IN THREE MINUTES

Will do the work so much better, quicker and easier you cannot afford to be without one. Let us send you one today on 30 Days' Free Trial; you run no risk whatever, you to be the sole judge. If after 30 days it does not do all we claim and give you entire satisfaction, send it back at our expense. For further information write

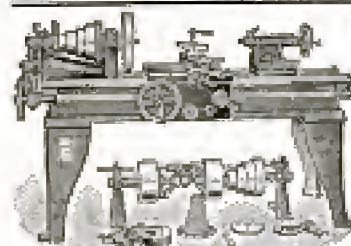
CLIPPER BELT LACER CO.
1032 Front Ave. Grand Rapids, Mich.



Print Your Own

Cards, circulars, menus, newspaper, book, etc. **THE PRESS** \$5, larger \$15, Rotary \$30. Save money. Big money printing for others. All easy, rules sent. Write factory for illustrated press catalog, TYPE, cards, paper, samples, etc. **THE PRESS CO., Meriden, Conn.**

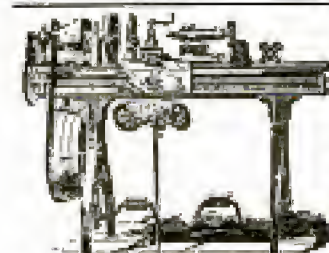
ers. The foundation of the inlay is of five-ply basswood, making a plate 1 1/4 in. thick. The inlay itself is 3/16 in. thick, so that the top can be refinished many times without obliterating the pattern.



OUR BIGGEST LATHE VALUE

16-inch Lathe with 8-foot bed, \$252.00; other sizes at proportionately low prices. Every lathe guaranteed. Buy your lathe from us and save \$50.00 or more. Machinery Catalog No. 261139 sent free on request.

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LATHES

9 to 18-inch Swing

List price \$75 and up according to size. When ready to buy send for Lathe Catalog and prices.

W. F. & John Barnes Co.
100 Ruby Street, ROCKFORD, ILL.



South Bend Lathes

For the Machine and Repair Shop

12 inch Lathe Complete,	\$100.00
12 inch Lathe Complete,	125.00
12 inch Lathe Complete,	150.00
12 inch Lathe Complete,	200.00
12 inch Lathe Complete,	250.00
12 inch Lathe Complete,	300.00

Straight or Gap Bed. Send for free catalog giving prices on entire line. **SOUTH BEND MACHINE TOOL CO.** 423 Madison St., South Bend, Ind.

How to Run a Lathe

A 50 cent book for 10 cents. Postpaid, stamps accepted.

\$2430⁰⁰ IN 90 DAYS

Twenty-seven dollars a day actual clear cash profits is what one man made in just three months with a Helm Press in a little town of 275 inhabitants. He saw a big opportunity in manufacturing pressed cement brick and blocks, was quick to grab it and is realizing big money now.

Look round about you. See how concrete is taking the place above all other materials in building construction. Realize what a chance is yours now to get in this big industry on the ground floor.

Twenty to fifty dollars a day profit is easily made with the Helm Press. You will be turning out a product that is as staple as sugar, as much in demand as the clothes on your back.

Ten Billion Brick are used every year in the United States. Thirty-three and a half million every working day of the year. Consider how enormous the demand, how contractors are crying for more brick. Be the one to supply this demand in your locality. You can start in this business. Be a manufacturer of pressed cement brick and make money from the start. No experience is necessary and as low as \$50.00 starts you.

There Are Big Contracts With Their Big Profits

Ready For You



No matter where you are, how little the town or how big the city. Builders are turning to this product because it solves the problem of high cost of building. Concrete must take the place of wood, stone and clay. Here are experiences which you can duplicate in your community:

I landed a \$90,000 government contract with Helm pressed cement brick.

Just landed a contract for 400,000 Helm pressed cement brick.

We are working on a contract for half a million pressed cement brick.

Made a million brick this season on one of your Helm presses.

My daily manufacturing profits on pressed cement blocks average \$25.00.

Working on a contract for a quarter of a million pressed cement brick.

Made 17,000 pressed blocks for one contract in less than a month.

Six weeks behind on Helm pressed cement brick and block orders.

We want you to know more about these manufacturers who are landing the big business and making the big money. We want to show you how they started with but little capital.

Factory Owners are the biggest money makers in America and this machine will place you in their ranks. You can start with little capital and even without experience. This is the machine for you because it makes pressed cement brick and blocks under 80,000 pounds pressure. No tamping and easy work. It makes 1,000 blocks or 10,000 brick daily. No burning required. Ready for the market in a few days' time. Eventually some one will make pressed cement brick and blocks in your community, but now the opportunity is yours. No matter if cement products are now made there—these brick and blocks made by pressure will be demanded.

The possibility of failure in this business is almost eliminated. You can enter it with almost a dead certainty of meeting success. Costs you nothing to learn all about it. Fill in the coupon here, mail it today and receive free, full information of the Helm Press and money to be made in the cement brick business.

Helm Brick Machine Co.

122 Mitchell St.,
CADILLAC, MICH.

Please send FREE the book on concrete and Helm presses.

Helm Brick Machine Co.

122 Mitchell St.,
CADILLAC, MICH.

NAME.....

ADDRESS.....



Powerful, Compact, Convenient

This "Yankee" Push Brace No. 75 can be used in tight corners and places where the bit-brace is a clumsy tool.

No. 75 has famous "Yankee" Spiral Ratchet drive, all you do is "push." Quick on boring—holds all usual wood drills and bits with square shanks up to $\frac{1}{2}$ inch. Speedier than any other tool for light drilling in metal, for driving or drawing heavy screws, or running-up nuts on bolts. On automobile or light machinery repair work, and about the garage it is a tool of big usefulness.

"YANKEE" Push Brace No. 75. Price \$2.80

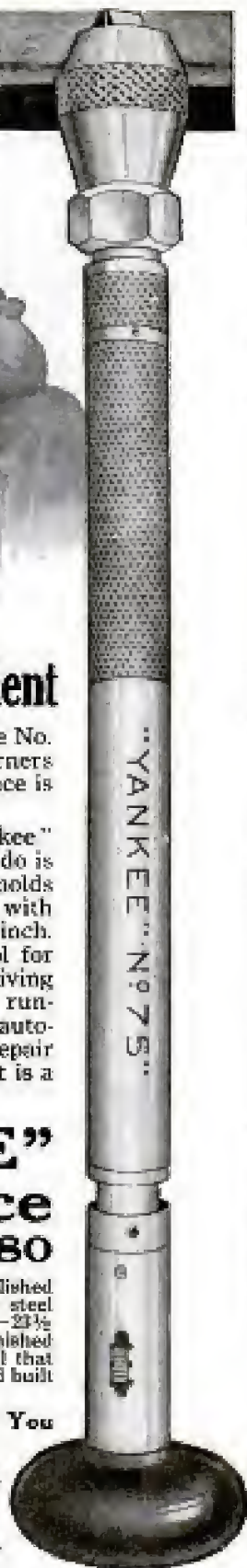
Heavily nicked. Hardwood polished handle. Drop forged, hardened steel jaws. Length 16 $\frac{1}{4}$ inches closed—23 $\frac{1}{2}$ inches extended. Every detail finished and surfaced with "Yankee" skill that reduces friction to a minimum, and built for strength and long life.

Your Dealer Can Supply You

Write for "'Yankee' Tool Book" FREE—for mechanics and amateurs. "'Yankee' Tools in the Garage" for Motorists.

North Bros. Mfg. Co.
PHILADELPHIA

"YANKEE" TOOLS
Make Better Mechanics



The Hardware Man has a Carborundum Stone for You



A sharpening stone that cuts fast and clean—that will not fill or glaze, if properly used—a stone that holds its shape and really *CUTS* the edge on the tool.

A Carborundum Sharpening Stone should be in your tool-kit.

Made in many shapes and sizes—and for every sharpening need.

Ask to see the round combination Carborundum Bench Stone.

THE
CARBORUNDUM
COMPANY
NIAGARA FALLS, N. Y.

Please Mention Popular Mechanics

MAKE \$250.00 A MONTH

Repairing AUTO-Tires

Sounds like a lot of money
—IT IS—A WHOLE LOT of MONEY
to be earning CLEAR every month—yet it's
what hundreds of men we have established in the
Automobile Tire Repair Business are making.

You let down the DRAW BRIDGE for SUCCESS to enter into
your career by getting into business for yourself. The business for
you is the one where investment is small—the returns quick and for cash
—where the margin of profit is large—the demand for your PRODUCT or
SERVICE constant and ever on the increase.

A Haywood Tire Repair Equipment

answers to all of these requirements of Old Dame Fortune—the certainty of success in this
business is as sure as anything in this world can be—Each year adds thousands of new
Automobile Owners—they need YOU to keep their tires in service.

Here Is Your Opportunity!

Be first to enter this new big paying business in your town. Open your pockets. Let the dol-
lars pour in. Act quick. Every auto sold means more tires to mend. Automobile business is
growing fast—enormous field for tire repairing. Punctures and blowouts are common. Tires need
retreading and vulcanizing. Something going wrong all the time. Thousands forced to buy new
tires because they can't get old ones fixed. Think of the old bicycle days—repair shops on every
corner—all making money—busy day and night. Autos make same proposition over again—only
ten times bigger and better. Users of Haywood Tire Repair Plants are making big money. Johnson,
Tex., writes: "I have made as high as \$18 in a day." Another man who bought a plant Septem-
ber, 1911, writes he has cleared over \$3000.00. That's going some! Operate a plant as side line
in connection with auto business—garage or as
an independent business. Find neighbor-
hood where there's a bunch of autos—get
all the steady business besides transient
work. Experience unnecessary. You learn
quick. Simply follow directions—practice
a few days on a couple of old tires and
you'll be ready to coin money. Business
comes fast and easy.

The New Money-Making Business—Start Now

This Man is Making
Money

This
Bunch
of Tires
Will Make
Several
Dollars
Profit

Business
Developing

Don
Your-
self
What
This
Man
Is

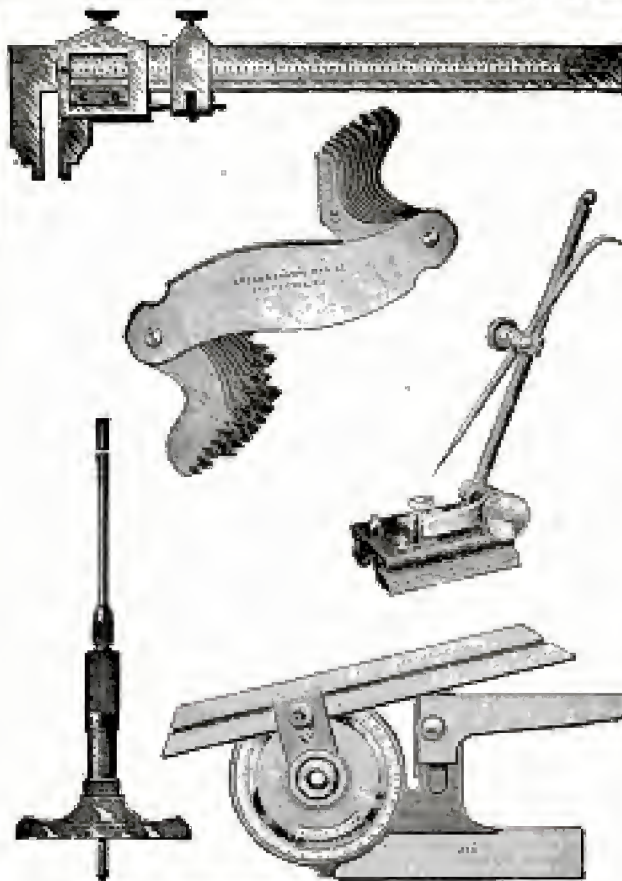
Repair Tires At Home.

Young men! and boys repair father's tires—get
money he pays garage man. Get the neighbor's
work. Make money to attend college or to start
a garage and repair business. Auto owners—re-
pair your own tires—save money—pay for your outfit
in short time. We have outfits for home use. Any-
how investigate. Send today for catalogue. See the
wonderful possibilities in this marvelous field. Learn
of the enormous money-making opportunities in
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Haywood Tire & Equipment Co.

842 N. Capital Avenue
Indianapolis, Indiana

Please Mention Popular Mechanics



Ever Use Any of These?

If you want a kit that is ready for any job, you need them. But whether you are buying these shown here or others, you want tools that "feel right" in your hand. You want them handy and always to be trusted. It's good tools that make you do your best work.

BROWN & SHARPE Machinists' Tools

are the well finished, reliable kind that every mechanic is proud to own.

There are micrometers, verniers, dividers, protractors, squares, rules, indicators, gauges of every sort; so many kinds and so attractive that you should stop in at the nearest big hardware store and ask for one of our free catalogues, illustrating and describing them all. Or drop us a postal and ask for Catalogue No. 25.

BROWN & SHARPE MFG. CO.
Providence, R. I.

"Fixing to stay!"

Your tools should serve properly and remain in good shape. This thought gives us the opportunity to tell you of the efficiency and satisfactory character to be found in every tool offered by Williams. Goodness was deliberately planned for and we'll "make good" if proved not that way.

Clamps for Every Purpose

*NEW (FREE)
CATALOGUE
IN FEBRUARY*

J. H. WILLIAMS & CO.
SUPERIOR DROP-FORGINGS
47 Richards St.
Brooklyn, N. Y. City

Western Warehouse
32C So. Clinton St., CHICAGO, ILL.



"Vulcan" Tool Makers' Clamps
4 sizes, capacity 0 to 4"

How to Solder 10c

Solder at home—save money. Solder for others—make money. Send 10c in stamps for complete instructions, fully illustrated. Keep back if not satisfied.

THE M. W. DUNTON COMPANY, PROVIDENCE, R. I. IN STAMPS

CHEAP METHOD OF PREVENTING FLY BREEDING—According to a recently made statement by the Department of Agriculture, borax will kill fly eggs,

Searight Compound Lever SNIPS \$1.00 to \$3.50

Made of Cradble Tool Steel. Smallest sizes cut up to 18 gauge, largest cut 16 gauge at the point easily. Just the tool for you to master what you like.

7 inch	.....	\$1.00
8 "	.....	1.50
10 "	.....	2.25
12 "	.....	3.00
14 "	.....	3.50

7 inch size pressed, all others drop forged.

Bartlett Manufacturing Company Box 5, Bayview Bldg. DETROIT, MICH.

RED DEVIL No. 50



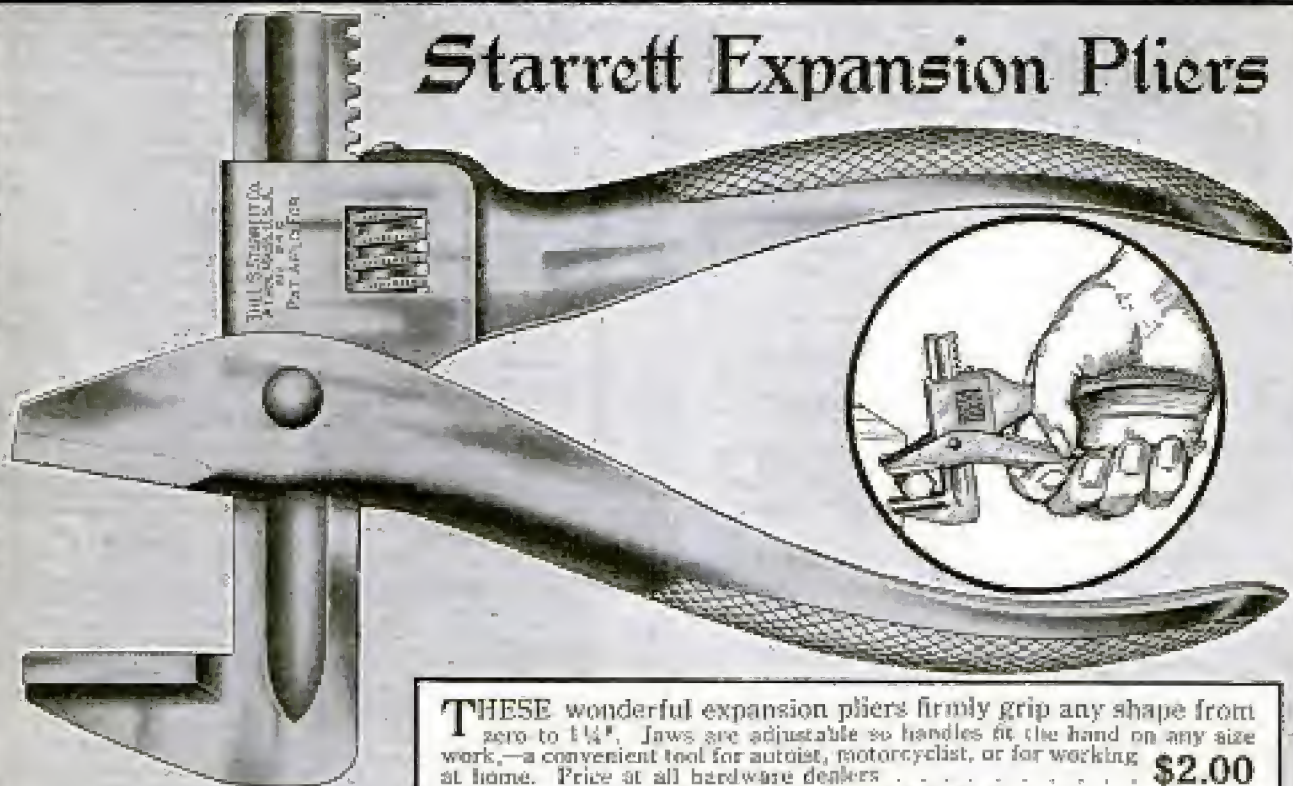
Drop Forged, Hand Honed Side Cutter

New style dentype milled handles of latest scientific shape.

Red Devil Tools are made by good mechanics for good mechanics. At your dealer's or send 75 cents for sample 6-inch size. Send for booklet of RED DEVIL Tools anyhow.

SMITH & HEMENWAY CO. 161 Chambers Street NEW YORK CITY

Starrett Expansion Pliers



THESE wonderful expansion pliers firmly grip any shape from zero to 1 1/4". Jaws are adjustable so handles fit the hand on any size work,—a convenient tool for autoist, motorcyclist, or for working at home. Price at all hardware dealers **\$2.00**

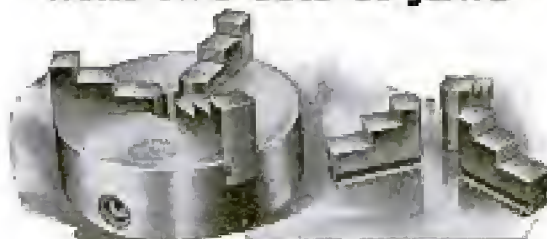
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The L. S. Starrett Co. Athol, Mass.
World's Greatest Toolmakers

and about 2 oz. per garbage can will prevent flies from breeding. Propagation in stables, garbage piles, rubbish heaps, and in fertilizer can thus be prevented cheaply without lessening the value of the decaying matter for use by the farmer. Borax, to the amount of 2/3 lb., or 1/4 lb. of crude calcium borate, was found to eliminate breeding of flies in eight bushels of fertilizer. This discovery will doubtless assist health authorities in campaigns against the typhoid fly, and contractors should welcome the method as an aid to keep construction camps free from flies.

Union Geared Scroll Chucks with two sets of jaws



Made in a wide range of sizes

Union Mfg. Co., New Britain, Conn.

\$1.00

Postpaid

Myers' Wonderful Sewing Awl

sews leather, canvas, shoes—anything, heavy or light. Complete repair shop in itself. Saves many trips to town. Mends harness, saddles, wagon covers, blankets, heavy tops, belts, etc. Can't get out of order. Original not only sews with diamond point full ground needle to protect the thread. BIG MONEY FOR AGENTS.

C. A. MYERS CO., 6338 Lexington Ave., Chicago, Ill.

SIMONDS NO-SET HAND SAW Cuts Smooth Like a Plane

This new Simonds Saw gives a cut which is almost as smooth as if sand-papered—the sides of the cut are finished by the saw.

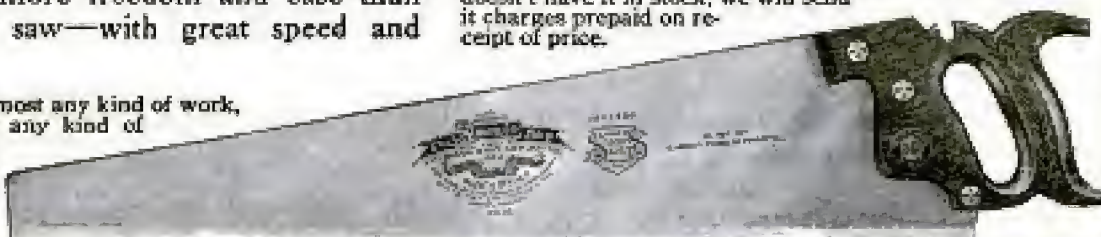
It runs with more freedom and ease than the ordinary saw—with great speed and trueness.

For finishing almost any kind of work, for quick cutting any kind of

dry wood, you need this saw, no matter how many saws you now own.

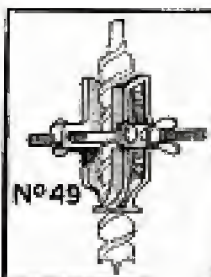
It is a most beautiful and workmanlike tool, with a Simonds special crucible steel blade, straight back, four brass screws and large hand hole in a carved and polished apple-wood handle. Price, \$3 each. If your dealer doesn't have it in stock, we will send it charges prepaid on receipt of price.

Simonds Mfg. Co.
"The Saw Makers"
Fitchburg, Mass.
(Founded 1857)



Stanley Tools

Adjustable Bit Gauge



A most convenient tool for
Anyone using a Brace and Bit.

It can be attached to bits of any size up to one inch in diameter and can be set for the bit to bore holes of a uniform depth.

It is so constructed that it insures the bit remaining upright when the desired depth is reached, thus preventing the worm being bent or broken.

Price 50c Each

If you cannot procure this tool from your hardware dealer, we will upon receipt of price forward same postage prepaid to any part of the United States. Address—

STANLEY RULE & LEVEL CO.
NEW BRITAIN, CONN. U.S.A.

GASOLINE SOLDERING IRON BLOWTORCH

WAR on Charcoal and Gasoline Fire Pots
Address Dept. 1, EMMELMANN BROS. MFG. CO., INDIANAPOLIS, IND., U.S.A.

Large Profits from Small Capital



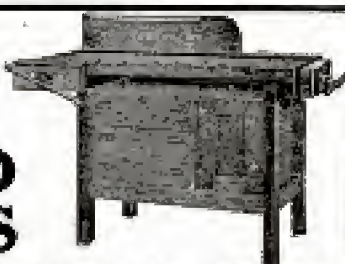
A Business of your own bringing you an income of at least \$10.00 per day with practically no experience or overhead expense.

The Green AUTOMATIC MACHINE

sharpens, hones, and straightens all kinds of safety razor blades, all in one operation, at the rate of 150 to 250 blades per hour, you can readily figure your profits. Let us send you our free booklet explaining everything.

Am. Sharpening Machine Co. (Inc.)
Dept. 2, 184 W. Washington St., Chicago

A Bench like
this is just the
thing for the
home.



OHIO TOOLS



REGISTERED

Planes, Chisels, Auger Bits, etc.
It will pay you to insist upon
getting tools of this brand.

CATALOG FREE

OHIO TOOL CO.
Dept. 3 Charleston, W. Va.

YOU CAN DRILL WHERE YOU CANT DIG

There is a big opportunity in every community for a capable man to establish himself in the well-paying business and make money. The right kind of a man with the right kind of equipment can be independent. Let your equipment be

★ DRILLING MACHINES

Equipped with either steam or gasoline power. Thousands of STARS are now in use. The demand for drilled wells is increasing. You can drill where you can't dig. It is a well known fact that there are but few places where water cannot be obtained by drilling. Write us today for catalog (enclose 2c for postal) and let us show you the superiority of STARS. Furnished on payments, if desired.

THE STAR DRILLING MACHINE CO.
506 Washington Street Akron, Ohio



Portable Cases

FOR TOOL MAKERS
AND MACHINISTS

Twelve styles, felt lined drawers, solid brass trimmings, best of material, beautiful finish, low prices, satisfaction guaranteed. Ask for booklet of cases built for service.

The Pillied Lumber Co.
SWANTON, OHIO

THE MASTER SLIDE RULE

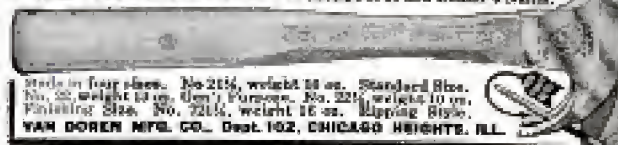
IMPROVED INTERLOCKING
RUST PROOF - FOOL PROOF

the only RULE IN THE WORLD whereby inside measurements of doors and windows, etc., can be taken rapidly and accurately. Also superior to any other rule for outside measurements of walls, steel joists, etc., as it can be extended and closed instantly. **MECHANICS, BUILDERS, AND ARCHITECTS, TRY ONE TODAY! DON'T WAIT.** Ask hardware dealer for it. On receipt of 25 cents per linear foot, a 4, 5, 6 or 8 foot rule will be sent to you prepaid. Large profits to agents. Write for circulars and particulars. **DAHL MFG. CO. 51-A East 42nd St. NEW YORK CITY**

IMPROVEMENT IN CONCRETE RAILROAD TIES—A process of manufacturing perfectly homogeneous reinforced-concrete ties mechanically has been discovered and practically applied in France. Fine iron turnings are mixed with concrete, and then pressed together to shape under powerful hydraulic presses. Ties of this type have been in use for two years, and are said to be giving complete satisfaction.

YOU OUGHT TO HAVE ONE OF OUR Insured "Vandor" Hammers

—Once forged from Vandorium Steel, tempered in oil and warranted for a lifetime. Best Postpaid anywhere on receipt of \$1 and Dealer's Name.



Made in four sizes. No. 2114, weight 14 oz. Standard Size. No. 22, weight 17 oz. Gen'l Purpose. No. 221, weight 10 oz. Piling Size. No. 7214, weight 16 oz. Piling Size. **VAN DOREN MFG. CO. Dept. 102, CHICAGO HEIGHTS, ILL.**

MILLERS FALLS TOOLS

Braces
Drills

Hack Saws
Mitre Boxes

Do Better Work and Last Longer

Write for catalog showing complete line.

MILLERS FALLS CO., Millers Falls, Mass.

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Tells how to help save money for yourself or employer. Just the thing for Mechanics, Electricians, Engineers, Contractors and Executives. Write today for this handbook—FREE.

State your business

VAN EXPANSION BOLT MFG. CO.
1209C Fort Dearborn Bldg., Chicago, Ill.



**Freedom
with Fit
Comfort
with
Style**



HERE'S a homelike glove—designed for driving or work, and made as carefully in details as the finest kid. Easy, yet not "baggy," and slips on and off in a jiffy. Allows finger-freedom (almost like bare hands) with perfect fit and style.

Hansen's Dan Patch Glove

cannot scuff, harden, crack or peel, and gives far greater wear than the best kid glove. Cheaper in the end than a dozen flimsy makeshifts.

Send for Free Book of Gloves

At your dealer's or write for information

O. C. Hansen Mfg. Company

291 A. A. Milwaukee St. Milwaukee, Wisconsin

GOETHE'S PROPHECY OF THE PANAMA CANAL—In a book, entitled "Conversations with Goethe," and written by a close companion of the poet's declining years, may be found, according to Office Appliances, the following statement by Goethe, made early in the year 1827, on the subject of a Panama canal:

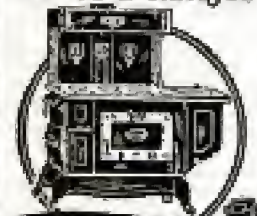
"If a cut of this kind should prove successful to the extent of making it possible for ships of any cargo and of any size to pass from the Gulf of Mexico into the Pacific Ocean, this would result in incalculable advantages for the entire civilized world. It would surprise me if the United States should allow itself to miss the opportunity of undertaking such a task. It is to be foreseen that this youthful country, in view of its decided tendency toward the West, will have taken possession of, and populated, the vast areas beyond the Rocky Mountains in thirty or forty years' time."

PRINCE ALBERT

the national joy smoke

Book Tells All

Stoves & Ranges



A Kalamazoo
Direct to You

Secrets about ranges—their low cost at factory—and how to get the actual factory price yourself. A genuine glass oven door model put in your kitchen for a long free trial—year's test. \$100,000 backs up guarantee. Postal card may save you \$25. Write today. Ask for catalog No. 473.

Kalamazoo Stove Co.
Manufacturers
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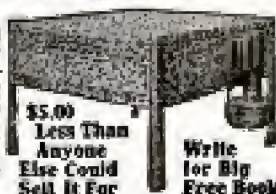
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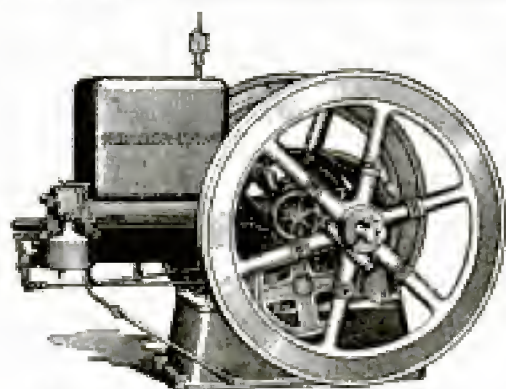
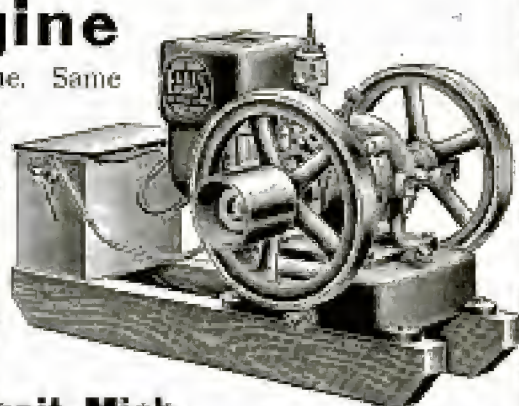
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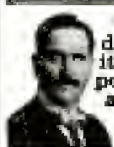
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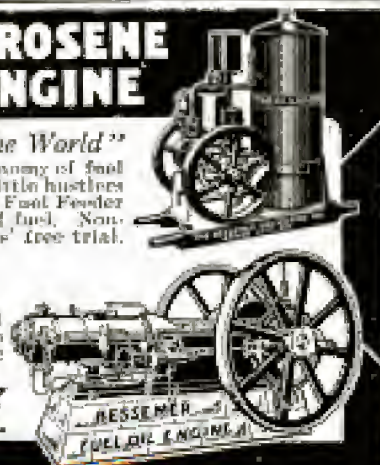


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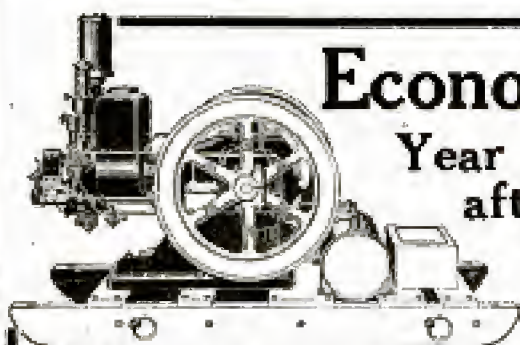
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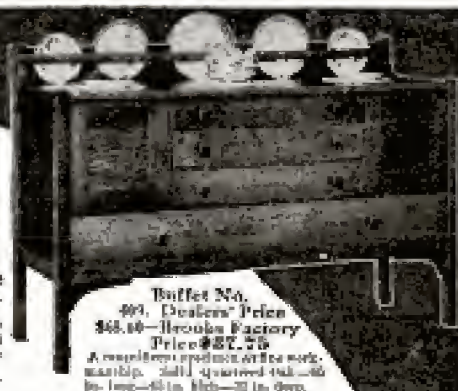
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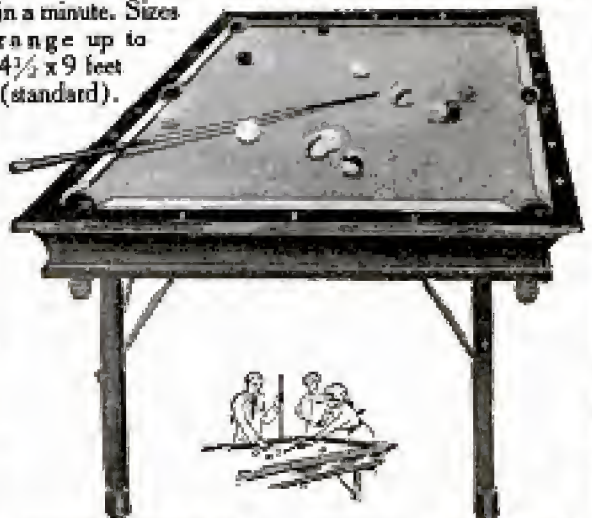
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Play Billiards at Home! The Cost is Trifling

A few cents a day will soon make you the owner of a handsome Burrowes Table. You can play on the Table while paying for it. No special room is needed. Burrowes Tables can be mounted on dining or library table or on their own legs or folding stand. Put up or taken down in a minute. Sizes



range up to
4 1/2 x 9 feet
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Billiard and Pool Tables

are splendidly made and correct in every detail. The most expert shots, calling for skill of the highest order, can be executed with the utmost precision. Some of the leading professionals use Burrowes Tables for home practice.



\$1.00 DOWN

Terms are very easy—\$1 or more down (depending upon size and style selected), and a small amount each month. Prices from \$15 up. Cues, balls, etc., free.



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On receipt of first installment we will ship Table. Play on it one week. If unsatisfactory return it, and on its receipt we will refund your deposit. This ensures you a free trial. Write today or mail this coupon:

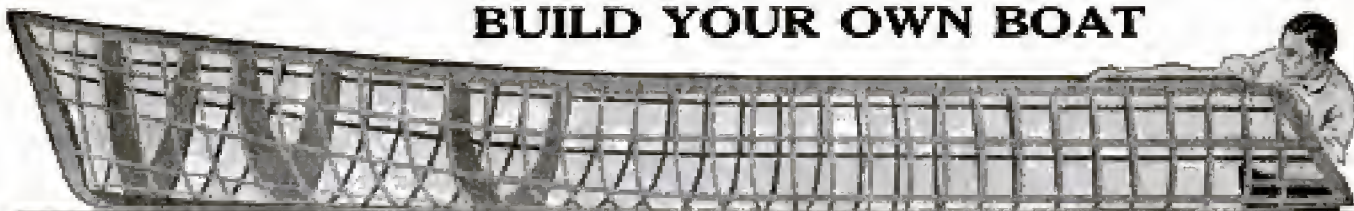
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164 Spring Street, PORTLAND, ME.

Please send catalog of Billiard Table offers.

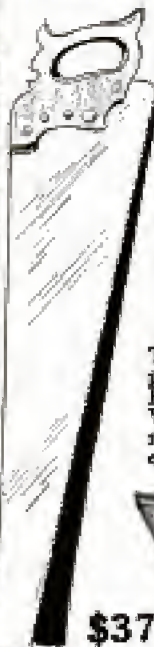
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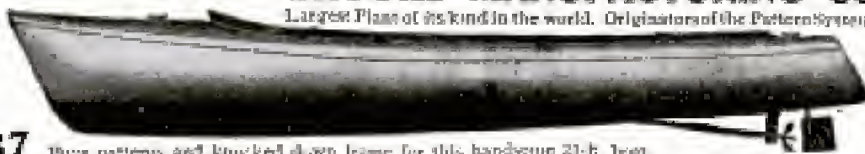
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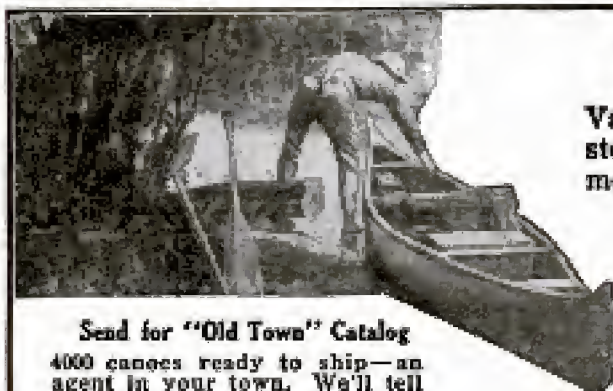
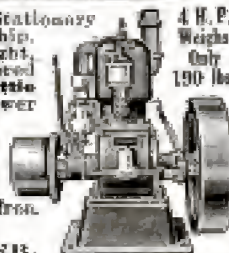
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Represent a great advance over ordinary stationary engines in design, material and workmanship. Highly efficient because of light weight, higher speed, reduced friction and lowered operating cost. 4 Cycle, 4 to 20 H. P. Throttle Governor insures fuel consumption and power in proportion to load. Ideal for electric lighting plants and other uses where very steady power is required. Equipped with Schebler Carburetor and Friction Clutch Pulley. Not a cheap engine, but cheap in the long run. Engine Book free.

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4000 canoes ready to ship—an
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OLD TOWN CANOE CO.
1462 Middle Street Old Town, Maine, U. S. A.

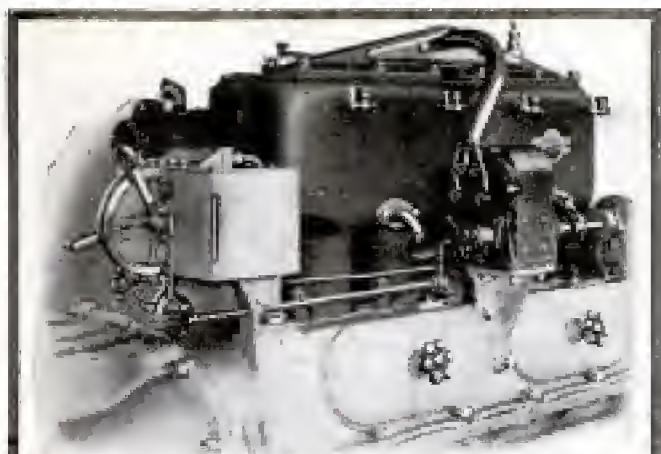


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It's made in the Maine woods, of seasoned cedar, by seasoned workmen. It won't crack or leak or bulge or act cranky in any way. That's why nearly every knowing guide and trapper owns an "Old Town," and that's why it gives lifetime service; that's why there are more "Old Town Canoes" than all other makes put together, and that's why you should own one.



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WATKINS' SPECIAL MOTORS
3 H. P. Single Cylinder . . . 34 lbs.
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A strictly HIGH GRADE Motor that
will give CONSTANT and EFFICIENT service.
Especially adapted for CANOES and LIGHT
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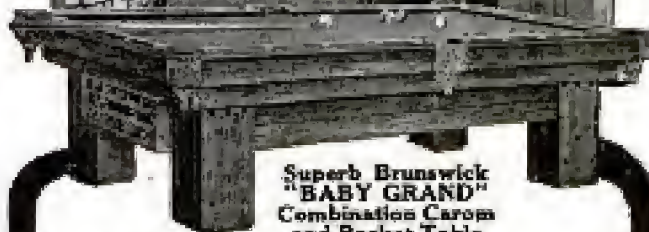
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Burn Gasoline,
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Combination Carom
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Mail the coupon and learn in this hand-
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And see the famous Brunswick "GRAND,"
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They are *real* Carom and Pocket Billiard Tables
with life! speed! and accuracy!—not toys or
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For Rowboats
and Canoes



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The exclusive patented feature of Joymotor that makes it the safest, most convenient, easiest to handle motor in the world. No more danger of accidents. No drifting or paddling to dock or shore. No more awkward, hurried cranking to reverse the motor. Just move the steering tiller to right or left and Joymotor almost instantly—

Stops your boat and backs it up without reversing the engine

"Joymotor is rightly named"—
"A joy to own"—"evidently built to enjoy"—that's what owners tell us. Easily portable. Weighs 52 lbs. Runs your boat 7 to 9 miles per hour—draws 10 to 12. Has real high tension fuel valve and real carburetor, efficient oiling system and does not have unsightly, tangled up pump hose. Write postal now for catalog and life size picture of Joymotor giving full details of the finest, most satisfying portable motor to be had. Write postal now to

JOY ENGINEERING COMPANY
230 Tribune Bldg., CHICAGO



This picture shows how Joymotor steering tiller swings and reverses position of propeller. Compare this position with large picture.

Unmatched Speed—Extra Power NO VIBRATION

Speed that runs away from any other rowboat motor—power to carry heavier loads—no vibration to shake the boat or mar the pleasure of riding.

2 CYLINDER ROWBOAT KOBAN MOTOR

Is the wise man's choice this year. Last season's records proved its merit. Absolutely dependable under all conditions—easy to start—reverses while running by simply pressing button—best ignition, outfit money can devise.

2 CYLINDER—RACER TYPE

The Koban Motor has 2 opposed cylinders—that's what removes the vibration—3 H. P. nearly double that of other motors—speed line propeller. Beyond question the best constructed rowboat motor on the market.

Write for 1913 catalog. Active Agents wanted.
KOBAN MFG. CO., 151 South Water St., Milwaukee



3
H. P.

Electric Light for Your Home

This newly invented system enables every rural home to make their own electric current; operates from one to fifty lights; and will drive small electric motor, electric iron, toaster, etc. Everything complete in one compact unit; no batteries or switchboard. Uses standard lamps and fixtures that any dealer can supply. Nothing to watch but the small, high-speed gasoline motor, which requires slight attention once a week.

The ideal electric lighting system for country homes. Nothing like it ever sold before. Costs less than other systems to buy and to operate. Will last for years.

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GASOLINE-ELECTRIC UNIT
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A PECULIAR RIVER—The Deschutes River, Oregon, a tributary of the Columbia, has many remarkable features. Its natural flow is almost constant. In times of so-called floods it rises only a few inches, because, for a considerable part of its course, it flows through a region of lava and loose volcanic material which act as a huge sponge. The United States Geological Survey has just issued a comprehensive report discussing the river's possibilities, from which it appears that after allowing for irrigation, a total of 400,000 hp. may be developed.

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The Evinrude Detachable Rowboat and Canoe Motors embrace the Evinrude Automatic Reverse—Built-in Magnets—and Maxim Silencer, besides all of the characteristics of the 1913 Model.

Prices: \$60.00 to \$80.00

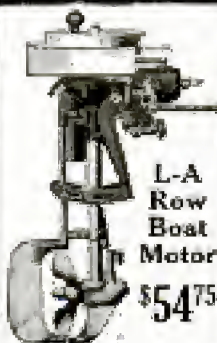
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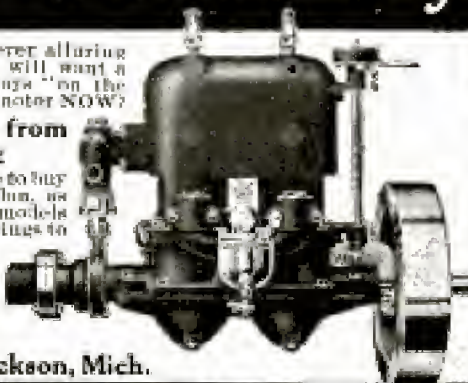
L-A
Row
Boat
Motor
\$54.75

Inevitably, winter will pass. Inevitably summer with the ever alluring joys of motor boating will return. Just as inevitably you will want a staunch, reliable Lockwood-Ash Motor—a motor that's always "on the job." So why not take time by the forelock and choose your motor NOW?

Post Yourself on How You Can Buy Direct from the Factory and Save the Dealer's Profit

Learn about our 30 days' trial offer which makes it just as safe to buy an L-A Motor on our Direct-from-Factory, Freight-Paid plan, as though you were dealing with your most trusted neighbor. Six models all guaranteed for one year and sold on 30 days' trial. No strings to this offer, no freight to pay. If you're not delighted with the motor, you return it at our expense. The 3 H. P. Motor with Outfit complete, here illustrated, freight paid, only **\$89.50**—no other money of at least 25 per cent. Write today for the L-A Engine book, and take your time in looking over the different models. Who waits? It's worth while to investigate now.

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Makes any boat a motor boat. 1914 Model, 3 H. P. Weight 59 lbs. Sold direct from Factory to you, freight paid. Save Agent's profit.



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DEMAND these essentials in an out-board motor, or you won't get your money's worth.

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4 Cycle, 4 Cylinder, 12 to 20 H. P.
Highest quality. Silent operation. No vibration. Controls like the best Motor Car engine. Extremely economical on fuel. Used as standard equipment by over 60% of the world's leading boat builders. Catalogue on request. \$150 to \$300 depending on equipment.
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1, 2 and 3 cylinder
Gasoline or Kerosene
Speed, regular, or heavy
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"Nothing Cheap but the Price."

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\$44.95

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You will be amazed at our rock-bottom direct-from-our-factory proposition on the genuine highest-grade Wing, guaranteed 40 years. No other manufacturers dared to meet our baffling offer. Let us quote you prices that local dealers cannot approach. Cash or easiest monthly payments as you prefer—but first four weeks' free trial. Since 1868—for 47 years—we have been building Wing pianos—renowned everywhere for their sweetness of tone and sterling merit. The Wing has all the fine qualities and every improvement of any strictly high-grade piano and **superior tone**. You pay not a cent for the trial—no deposit.

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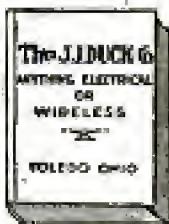
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Address.....

Please Mention Popular Mechanics

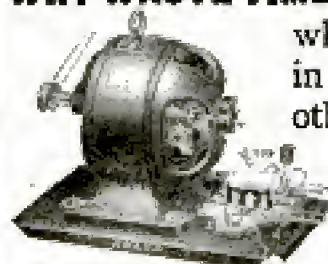
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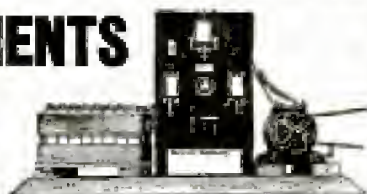
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Our catalog not only contains a wider and bigger selection of wireless instruments than will be found in any other three catalogs published, but everything worth while that may be found in any other catalog. Our large patronage and the supreme confidence of our patrons in everything we offer, impels every manufacturer to seek representation in our catalog. We too, are continually putting out new wireless instruments and are also always on the lookout for the latest and advanced types manufactured by others. All our goods are sold on a money back guarantee. These are a few of the reasons why the overwhelming mass of wireless experimenters have for years adopted the slogan



We carry a complete line of unexcelled lighting plants. Also separate switchboards, generators, ammeters, voltmeters, etc.

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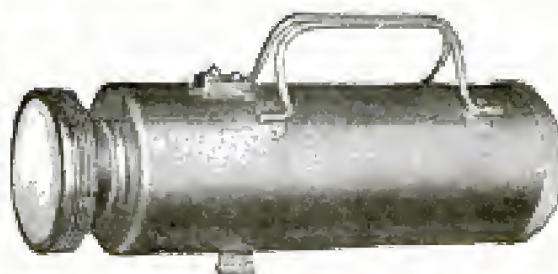
for use with the ordinary dry cell battery. Throws a brilliant light over 100 feet. Gives a concentrated light of 65 c. p.

In tests conducted in one of the highest laboratories in America our lantern was found not only to give a greater concentrated light than any other, but an increase of approximately 40% over another widely advertised lamp for which great claims are made. The difference is in the reflector and the lamp. This hand lamp will last sixty hours on continuous burning and longer if used intermittently. Indispensable to plumbers, automobilists, delivery men, switchmen, housekeepers, etc. Shipping weight, less batteries, 14 oz.

Complete, less battery, in burnished brass finish **\$1.90**

Complete, less battery, in pressed rolled steel

with hard rubber finish **1.50**



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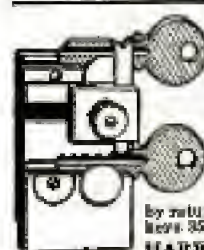
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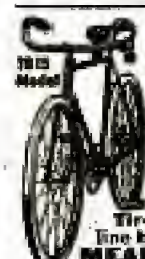


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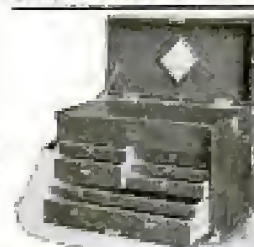
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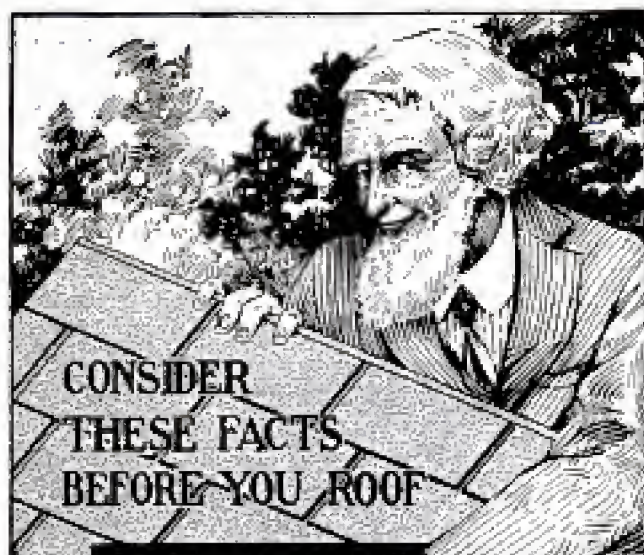
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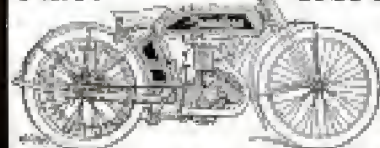
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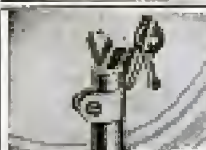
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\$500 to \$1000 a month. Profits soon pay for the machine. Business is not over-run—profitably—thousands and thousands of homes will never own a vacuum cleaner of their own. These will never think of owning them when they can depend on you.

You Can Start Small home on a street—even half the homes in that neighborhood want regular service. Endless things to be cleaned—rugs, mattresses, carpets, mattresses, curtains, upholstered furniture, besides walls and floors.



Write postal or letter for Free Book. Tells whole story.

Others Are Doing It—So Can You Churches, lodge rooms, hundreds of places can use your work. No experience necessary—just a little push and courtesy. Clear \$3000 upwards a year. Mr. Rainbow, writes: "The B. B. does all you claim. I knock out from \$20 to \$25 in six hours easily." When the money is earned it's practically all yours. The expense is trifling for the machine. Mr. Staley, writes: "It's the greatest dirt puller I ever saw. I make \$20 a day with it." Clean all these opportunities. Learn that there is no other business where so small an investment will bring such wonderful returns. In fact we have such implicit confidence in the wonderful money-making possibilities of our "Giant" B. B. House Cleaner—that we will ship one to you on **30 DAYS' TRIAL**

COME TO SEE US AT OUR EXPENSE

Up to a distance of 300 miles we will pay your traveling expense if you buy. Start now—come here—anywhere. Send today for our free book and complete particulars regarding the 30 days' trial. Figure the number of homes in your town—compute how much it costs to clean them each week. You can get part or all of this business. You have scores of friends who would gladly start you with their work—others will surely follow. You can depend upon a nice profitable business from the start.

The McCreery Mfg. Co., 1010 Front St., Toledo, O.

AGENTS—\$5.00 to \$25.00 a Day—It's Easy

Grand Invention. 150% Profit. Great Excitement
Recognized as most phenomenal seller

Experience Unnecessary. Spare time can be devoted if desired

LISTEN: One man's orders \$2,650.00 one month—profit \$1,650.00

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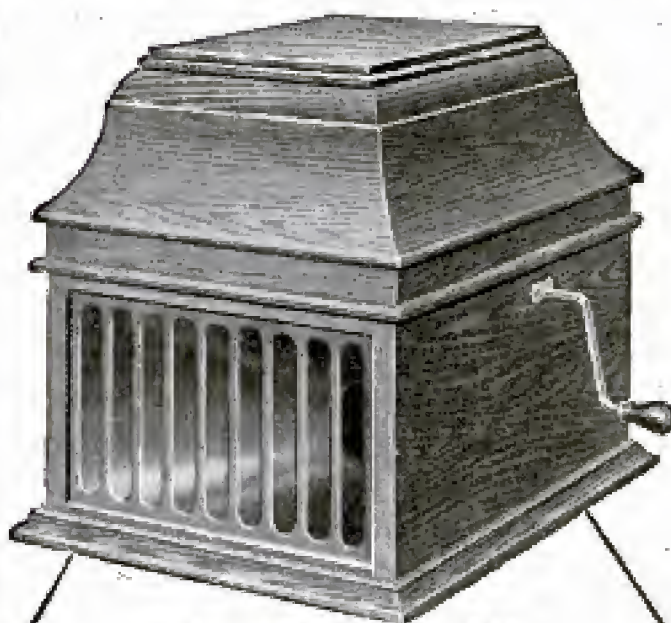
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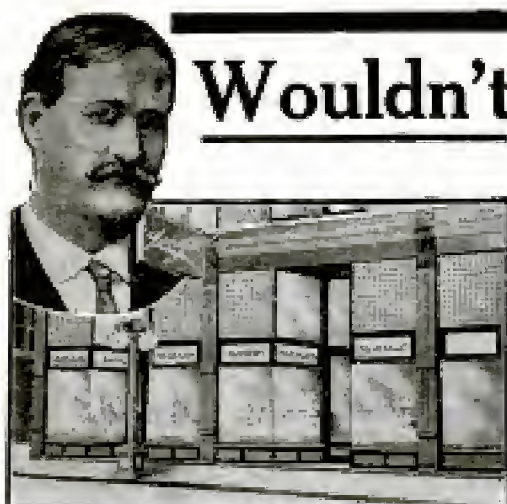
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Come to See Me At My Expense

Don't say you're coming. Just drop in quietly. Call on any banker or merchant. Ask them about Long—about my store—my crispette business. See if folks think I'll give you a square deal. Then come and see my store—see that it's just like the picture. See the machine. See crispettes made

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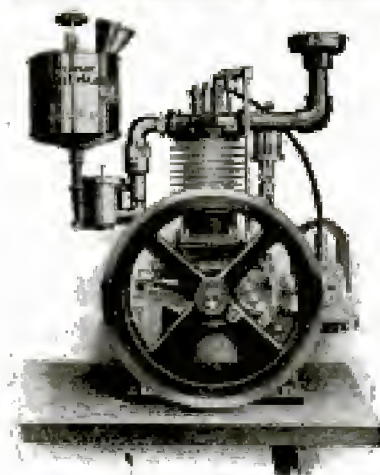


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This Marvelous $\frac{1}{2}$ H. P. Stewart Engine

is the strongest, sturdiest and easiest to operate of any. Does all work that $\frac{1}{4}$ horse power can do.

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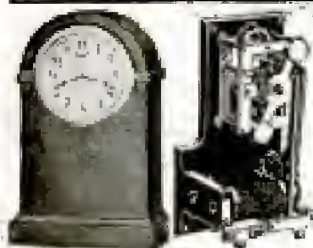
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SEPTEMBER MORN

WATCH FOR SOLID GOLD Finish. Just like illustration. The bewitching little figure of Miss September Morn" handsomely embossed on heavy metal, with **SOLID GOLD Finish.** 9" of Feb 1 1/2 x 1 1/4. Genuine black leather strap. Boys, a real work of art. Classy, alluring. **Makes 'em all take notice.** Agents wanted everywhere. Dandy sample for and our great money proposition to hustlers sent **postpaid 25 cents.** Address, **EMBLEM JEWELRY CO., 401 Morgan Building, Buffalo, N. Y.**



Self-Winding Clock

Marvelous new electric clock—dry cell battery—no wiring—runs anywhere. Winds itself. Clocks complete in many styles. For home, office and factory. No worry or care. Runs in any position. Low price. Special offer to introduce. Movements sold separate for timing devices and experimental work. Book on self-winding clocks and movements postpaid free. Send coupon or write.

American Self-Winding Clock Co., 136 W. Lake St., Dept. 5246, Chicago, Ill.

Economy in Your Pipe-Threading



Die-Stock No. 82

1/4 in. to 3/4 in. pipe

THE Oster Mfg. Co.

2100 East 61st Street
CLEVELAND, OHIO

THE secret of economy is in doing it right the first time. **Oster-Cut Threads** do not eat up dollars in costly repairs. They are always true, perfect threads, easily and quickly made. There are 47 Oster Tools for producing these threads. Learn about them in this attractive booklet. The coupon brings it.



OSTER CUT THREADS

Kindly send me the Oster catalog by return mail.

Name.....

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City.....State.....(2100)



SMALLEST GAS ENGINE

in general use. Thousands of powerful little "Redemotors" now in use on washing machines, bench lathes, railway speeders, pumps, separators, fanning mills, generators, etc. Relieve yourself from turning a hand crank or running a foot treadle and get a "Redemotor."

Runs on gasoline, kerosene, also runs fine on gas. Three sizes, 1/2 H.P., 1 H.P. and 1 1/2 H.P. Low prices. Send for catalog!

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Gentlemen: Send free book on self-winding clocks and movements and special introductory offer. No obligation.

Hello Boys!

MAKE LOTS
OF TOYS

I KNOW
YOU WOULD
LIKE TO WIN THIS
AUTO



\$3000 IN PRIZES

Help me—make some dandy new models different from any yet made. I'll pay you well in prizes to help me show thousands of other boys all over the world what a wonderful toy is

BUILD NEW MODELS FOR ME

ERECTOR

What are the Prizes?—Auto, motor cycles, bicycles, tents, canoe, camping outfits, skates, camera, Erector sets, air rifles, etc., etc.

300 Prizes—Just think of it!



THIS
FOLDER
GIVES
ALL
DETAILS
FREE

Ask your dealer for it. If he has no folders, write me and I will supply you. This folder illustrates and describes in great details all the 300 prizes so you'll know exactly what you're working for. It costs nothing to enter contest. Free entry blank is included in folder. Your Toy dealer sells Erector.

Yours for a dandy, good time.

A. C. GILBERT, President

The Mysto Mfg. Co., 253 Foote St., New Haven, Conn.



Lowest Prices on Steel Shingles

Save Money—Save Roofs from Fire, Rot and Rust

But you must act NOW. Offer will soon be gone. Edwards Steel Shingles now cover 135,000 roofs. Cheaper than good wood shingles. Last five times longer. Need no after care. A man with a hammer and nails can quickly apply them. The Edwards patented "Tightrope" process prevents rot, rust, fire. Millions have been saved to Edwards users.

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Limited**

Free Roof Insurance
Factory prices. Direct to you. Freight paid. Have a better roof, every way, and save money by acting now. Offer soon gone. More for your money every way. Quick action important. Costs nothing to find out. No obligation.

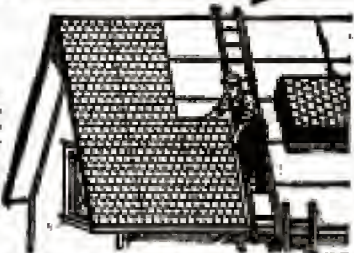
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Give size of roof, if possible, when you write. We will quote prices on entire job. New Bargain Circular contains prices that will make you gasp with wonder at savings they offer.

Write now for
Catalog No. 250

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NUGENT'S FROM-THE-FLOOR SHAFT OILERS
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50 Leading Boat Builders have joined with the Gray Motor Company in issuing a catalog showing the specialties of each, which includes fishing launches complete from \$125 upward to mahogany finished express launches with self-starting 4-cylinder 4-cycle Gray Motors for \$2500. Outlets from \$450 up. This book helps you select just the model of boat you have been looking for and tells you where to buy it and what it will cost. Send for this big Boat Catalog today. Free. Also Gray Marine Engine Catalog showing full line of 2 and 4 cycle marine motors from \$55 upward, one to six cylinders. **GRAY MOTOR CO., 230 Gray Motor Bldg., DETROIT, MICH.**

335 Candle Power
Cost 1c 10 hrs. fuel

POWERLIGHT THE HOME LAMP



Winner of the Gold Medal, the highest award at the International Safety Exposition, New York, December, 1914. The only lamp to receive an award. It's the safest, brightest and best: Burns kerosene or gasoline without wick. Can't explode or spill, stain or set glass dome.

OTHERS LOOK LIKE CANDLES

Must be seen to be appreciated. Don't buy any lamp until you see this one. An ornament to any home. Write for special offer. **AGENTS:** make big money, exclusive territory, samples loaned. Write today.

POWERLIGHT SALES CO.

95 Chambers Street NEW YORK

Ideal**POWER
LAWN MOWER****Combination
Mower and Roller****38-INCH CUT****\$400**

This newest machine is larger and more powerful than the 1914 model, and carries many improvements that will interest those who have the care of large lawns, golf courses, parks, etc.

A 5 horse-power motor (S.A.E. rating) with 6 adjustable cutter blades, 38 inches wide, and a roller 15 inches in diameter, it cuts 8 acres per day at a speed of one to 4½ miles per hour, at an operating cost of only 30 cents per day. It climbs 35% grades, cuts closely and evenly, is easily guided around walks, trees and shrubbery; and rolls the turf as well as cutting the grass, leaving the lawn in perfect condition. Neither hand-propelled nor horse-drawn mowers can compete with this machine in satisfactory results, economy of operation and all-round efficiency.

The Ideal Junior, a smaller power mower for \$225. Write for catalog and complete description of various sized power mowers.

IDEAL POWER LAWN MOWER CO.

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**New Ball Bearing
Worm Drive, Hand
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Grinder for only \$5****YOU'VE**

never seen as big value before in a grinder at the price. This new type "Best Maide" Tool Grinder operates equally well by either hand or foot power, sharpens all tools speedily, easily and accurately. Only foot power grinder made in which grinding wheel can be used in all positions. Equipped with guide that gives chisels and plane bits exactly the right bevel, either straight edge or hollow ground.

**LUTHER
"Best Maide"
Hand and Foot Power
Tool Grinder**

Rigid all metal frame. Ball Bearings. Worm Gears cut from solid steel. Tilting Frame. All working parts enclosed and dust-proof. Double faced "Dime-Grit" Sharpening Wheels—Medium Grit Body for bringing tool quickly to edge and Fine Grit Side Face that puts on finish like a hone. No water needed. Can't draw temper.

**New Honing Device \$1.00**

This device enables you to hone chisels and plane bits perfectly and give them any desired bevel. Prevents slips and jerks, but allows the free circular movement needed for proper honing. Priced for \$1.00—satisfaction guaranteed.

**LUTHER GRINDER MFG. CO.****90 Point St.****Milwaukee, Wis.****Six
Months
Free
Trial**

On receipt of \$5 we will send you this wonderful new grinder with the positive binding agreement that if you are not perfectly satisfied with it, you can return it at any time within six months and we will refund the price. Order direct from this advertisement, or send for descriptive circular and full details of Free Trial Offer. Give dealer's name when you write.



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He could scarcely wait for balmy spring days, to launch his Mullins Boat—now he begrudges every moment spent ashore. That's natural—so many of nature's really delightful spots are accessible only by boat. When you feel the call of the water and the wild places, remember

SAFETY MULLINS BOATS

Sturdy craft—and beautiful—designed by America's foremost Naval Architects, manufactured by the most modern methods in the largest boat factory in the world, powered with both 2 and 4 cycle motors.

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Also manufacturers of the celebrated CHARLES RIVER MODEL CANOES

Mullins catalog, beautifully illustrating in colors, our full line of wood and steel boats, a really fascinating book, is free.



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WHERE TO FIND IT—WRITE BUREAU OF
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Name.....
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Gentlemen: Enclosed
please find \$2.50 for
which please send
Hold Heet Stove on
30 days' free trial.

My money back if
not satisfied.

Hold Heet Stove \$250

Marvelous toaster stove. For toasting,
heating, frying. Toasts quicker. New
principle for holding the heat. Saves cur-
rent. Most useful stove for
toasting, warming, frying.

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No Metal To Burn You

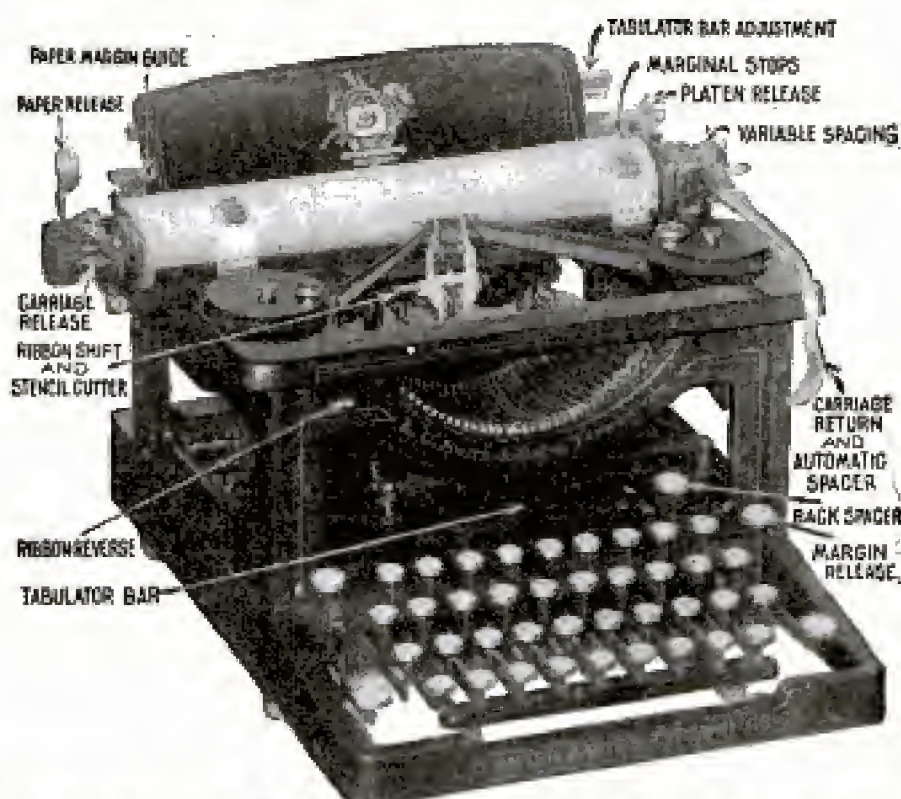
Made of new patented Hold Heet material. One solid piece, unbreakable finish.
Lasts a lifetime. Special limited introductory offer. Now only \$2.50. By parcel
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CHICAGO, ILL.





TYPEWRITER SENSATION

Free TRIAL—Use As You Pay

Only \$3.00 a month until the low total price of \$48.30 is paid, and the machine is yours

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay \$3.00 a month and own one. Think of it—Buying a \$100.00 machine for \$48.30. Cash price, \$45.45. Never before has anything like this been attempted.

Standard Visible L. C. Smith

Perfect machines, Standard size, Keyboard of Standard Universal arrangement writing 76 characters—universally used in teaching the touch system. (Keyboard writing 84 characters \$1.00 extra.) The entire line of writing completely visible at all times, has the tabulator, the two color ribbon with automatic reverse, the Back Spacer, in fact every late style feature and modern operating convenience. Comes to you with everything complete, tools, cover, operating book and instructions, ribbon, practice paper—nothing extra to buy. You cannot imagine the perfection of this beautiful typewriter until you have seen it. I will send it to you F. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at my expense. You won't want to return it after you try it—you cannot equal this wonderful value anywhere.

You Take No Risk—Put In Your Order Now

When the typewriter arrives deposit with the express agent \$3.00 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw, keep it and send me \$3.00 a month until our bargain price of \$48.30 is paid. If you don't want it, return it to the express agent, receive your \$3.00 and return the machine to me. I will pay the return express charges. This machine is guaranteed just as if you paid \$100.00 for it. It is standard. Over one hundred thousand people own and use these typewriters and think them the best ever manufactured.

The supply at this price is very limited, the price will probably be raised when my next advertisement appears, so don't delay. Fill in the coupon today—mail to me—the typewriter will be shipped promptly. There is no red tape. I employ no solicitors—no collectors—no chattel mortgage. It is simply understood that I retain title to the machine until the full \$48.30 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send me one cent. Get the coupon in the mails today—sure.

HARRY A. SMITH, 231 N. Fifth Ave., CHICAGO

H. A. SMITH
231 N. Fifth Ave.
CHICAGO, ILL.

Ship me a No. 2 L. C. Smith F. O. B. Chicago, as described in this advertisement. I will pay you the \$33.00 balance of the SPECIAL \$48.30 purchase price, at the rate of \$3.00 per month. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee for one year.

Name

Address

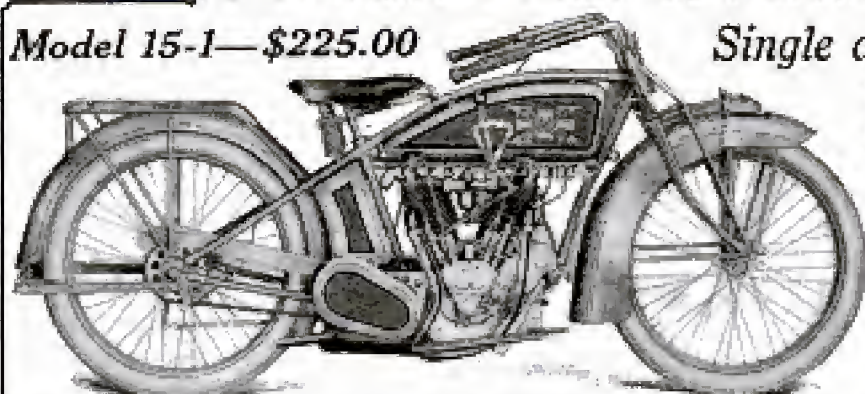
Pop. Mech., Feb.



The Latest and Greatest "X"



Model 15-1—\$225.00



Single and Three Speed

Everything that
Makes a Perfect
Motorcycle,
Brought to the
EXCELSIOR
Standard of
Efficiency

We cannot in this small space, even enumerate the big features that make this not only the Greatest "X", but the most perfect motorcycle ever built. Our new catalog fully describes the

EXCELSIOR AUTOCYCLE

with Single and Twin Motors, One, Two, and Three Speeds, with regular and full electric lighting equipment at prices from \$175.00 to \$275.00. See the Dealer or write for catalog to-day.

Excelsior Motor Manufacturing & Supply Co.
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Shown in the Photograph

ONE of our readers, who is strictly an amateur with tools, experienced no difficulty in making and finishing every piece of furniture, with the exception of the piano, shown in the accompanying picture. It is impossible in a small space to display all the different designs in Mission Furniture which we have published, but this picture shows something of the variety of pieces and how well they go together. The

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THESE books describe how to make furniture for every room in the house as well as swings for porch and lawn. Whether you need a complete set or only some special article to fill in with here and there, you will find full directions, dimensions and working drawings for making it in these books. The instructions are easy to follow and even the amateur can obtain most satisfactory results as related above. A complete list of the designs in each book will be furnished free upon request.

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A congenial companion and a Mullins canoe—lights dancing among the ripples—the gentle lapping of the water—the swishing of the dipping paddle—enchantment!

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sweep into the new season with added beauty and refinement. To the grace and lightness of the Indian canoe, we have added expert workmanship, exquisite finish and splendid durability.

Our canoe book is interesting—fascinating—free.

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*World's largest manufacturers of
Steel and Wooden Boats.*

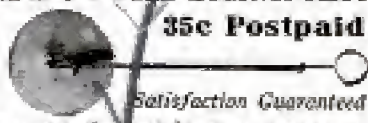
A street in Lyons, France—the Rue de la République—is paved with glass. The blocks are 8 in. square and so closely fitted that water cannot pass through the pavement.

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The Only Perfect
Cream Separator
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Experience Unnecessary

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BUILD YOUR OWN CAR

Send for blueprints and prices on complete parts for one of the best light cars or cyclecar on the market. Side by side seating. It will save you money.

THE B-Z-T CAR COMPANY, Inc.
Owego, Tioga County, NEW YORK

Store Profits

Increased \$3120 Yearly

Confectionery, drug and department stores, theatres, restaurants, news stands, etc., are reaping a year-round harvest of spot-cash sales from this famous BUTTER-KIST Corn Popper.

Hundreds of records to prove that it pays *five times as much profit per square foot as anything else in the store*. Stands anywhere—needs only 26 by 32 inches of space—move a chair and you have room for it. Runs itself.

Proven profits \$25 to \$60 weekly. Small confectioner sells \$5 to \$16 per day. Large department store netted \$508.50 in 28 days!

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BUTTER-KIST Pop-Corn

With Butter-Kist Prizes

"Everybody's" asking for the famous BUTTER-KIST—the big, fluffy, white flakes—crisp, crackling and clean—evenly buttered and piping hot—untouched by hands. The finest, flavory, savory treat that ever tantalized a mortal's palate—with a *coating fragrance* that makes people hungry for BUTTER-KIST.

Every bag bears pictures of the valuable BUTTER-KIST Kiddies and trademark that thousands are saving and sending to us for handsome prizes. Brings people back to your store for more BUTTER-KIST—throws trade to other departments.

Pay From Your Sales

A small payment down puts the BUTTER-KIST Corn Popper in your store with all privileges included. Then it pays for itself in short order.

Superbly built of plate glass, mahogany, oak or white enamel and metal parts of polished aluminum and nickel. Beautifies your store—motion draws crowds—*starts everybody talking and eating "BUTTER-KIST!"*

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Handsome new book, "The Little Gold Mine," gives facts, figures, *proof* of profits and photographs. Valuable to an aggressive dealer. Sent free postpaid. Write for it at once—you lose \$5 to \$16 in sales every day you delay.

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(60)



"100 MILES for 10 cents"

Weight only 110 lbs. Price only \$125

Something Entirely New!

It's not a motorcycle, and it's not a bicycle, but a real **motor bicycle**—something that every one of you can enjoy, and afford to own and maintain. It is the lightest, simplest and easiest-handled motor vehicle **in the world**. It places motor travel within the reach of thousands **for the first time**. It appeals alike to all classes—professional and business men, clerks, mechanics, salesmen, farmers, students, boys and girls.

The Miami Motor Bicycle
SAFE • SILENT • CLEAN

You can use it for a quick run to town and back; a trip over into the next county; a run out into the open, or to and from work every day. It is so light you can go anywhere that a heavier vehicle can—and it costs only ten cents a hundred miles.

It is safe for anyone old enough to ride a bicycle because it is so light and easily managed—and it is far superior to a bicycle for business or pleasure. It will take you from 4 up to 25 miles an hour—and the motor does all the work.

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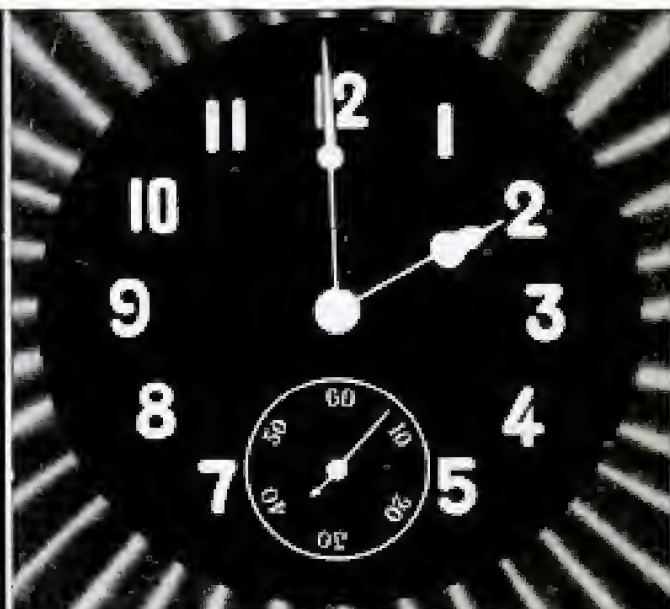
telling all about the Miami Motor Bicycle, how simple in construction and easy to take care of. You can buy one from your cycle Dealer or direct from us.

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Send for watch catalog describing, among others, the new radium dials that shine at night—the remarkable discovery enabling you to read time plainly in pitch darkness! The new catalog shows many other novel ideas in Burlington watches. The newest ribbon and enamel monogram designs—exquisite new ideas—your own initials in colors on a rich gold background. Send the coupon today.

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Learn the inside facts about watch prices and the many superior points of the Burlington over double-priced products. Just send the coupon or a letter or a postal. Don't delay—write—get this great offer while it lasts.

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Please send me (without obligations and prepaid) your free book on watches, with full explanation of your cash or \$2.50 a month offer on the Burlington Watches.

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Prest-O-Lite For Motorcycles

As Strong and Dependable as the Motorcycle Itself

Be as careful to buy a sturdy, reliable lighting equipment as you are to buy a sturdy, reliable motorcycle. Your safety demands it.

Prest-O-Lite is the only lighting system for motorcycles that has stood the acid test of continued use by experienced riders.

Cold and moisture do not affect it. Prest-O-Lite has nothing to freeze, no delicate wiring to snap

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The "spills" that are wrecking fragile lighting systems only serve to show the all-year-around value of sturdy, reliable Prest-O-Lite.

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Prove this on your own machine in your daily riding. Your dealer will give you 30 days in which to prove to yourself every claim made for Prest-O-Lite. If you're not completely satis-

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Dealers who know night riding and have your interest at heart, will recommend Prest-O-Lite to you. Any dealer selling "complete equipment" will include Prest-O-Lite. Leading

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Exchange Agencies Everywhere

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Secure exclusive sale of this new VACUUM CLEANER

Latest idea; most powerful; low price. Takes place of electric machine in country home. Six money for hustlers.

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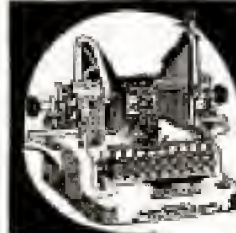
Address our place of business nearest you.

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Eight Sizes of Incubators

The United States Bureau of Mines has begun the collection of a general library of petroleum literature, under the direction of W. A. Williams, chief petroleum technologist. The details of this work have been assigned to Dr. David T. Day, who has recently been transferred from the United States Geological Survey as petroleum technologist, and who will also assist in a thoroughly organized research into the chemistry of oils, which is being developed by the Bureau of Mines. The importance of such a library is so manifest that it is hoped all technologists will aid in the work by exchanging with the bureau all available books and maps on this subject.



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Be strong, athletic, healthy, handle large men with ease. Farmer Burns, the world's most scientific wrestler, trainer of Frank Gotch, world's champion, will now teach you by mail. Also complete course in 10-Week self defense and physical culture. This opportunity ever offered to learn right from champions. For men and boys. 100 ages. A wonderful course. Low cost. Investigate now. You will be under no obligation whatever.

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Let us send you any Diamond you may select from our catalogue so you may compare our values with those offered by other dealers; be convinced that our IMPORTER'S PRICES offer you a great saving.

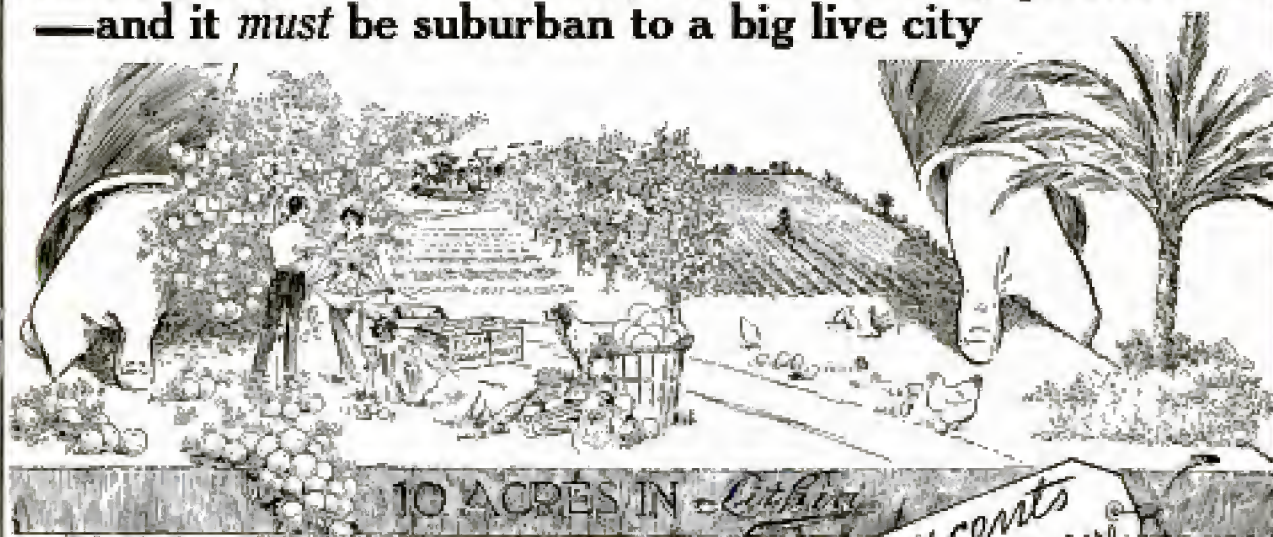
We furnish a guarantee certificate with every Diamond and allow the full purchase price on all exchanges. We will send express prepaid any Diamond or other article, for examination and approval, you to be the sole judge as to whether you keep it or return it at our expense.

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is compact, easy to pay for, and enormously productive
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Here it is—and it's yours for

3 1/2 cents
per day per acre

IN OUR NEW LITHIA TRACT SUBURBAN TO TAMPA, the metropolis of South Florida. It is one of the few choice suburban farm tracts left in Hillsboro County, the recognized center of Florida's grape fruit and orange belt.

This is the third great Hillsboro County tract that has been opened to homeseekers and investors by our old established, responsible, thoroughly experienced organization. Over 2,500 families are now rejoicing because they bought at opening prices in our two former tracts. Every family can tell you they got a square and generous deal.

Our new Lithia Tract now offers you the same wonderful opportunity—and more, because of the rapid growth and development on all sides within the past four years.

The visible supply of select Hillsboro County grape fruit land is melting away very fast. Prosperous homes are scattered around the Lithia Tract—grape fruit and orange groves are flourishing on all sides. Already buyers are building homes on our new Lithia Tract, and values are due to rise here just as they have in our two former suburban farm tracts in this same county.

Free—Absolutely Free—100 grape fruit and orange trees to each and every purchaser who reserves one of these farms before March 1st, 1915. These trees will be held in our Nurseries until you are ready to plant them. This will give you a splendid start in developing a grove which will bring you an ever increasing income and greatly increase the value of your entire farm. Mail the coupon today.

One judicious investment, remember, means more to your bank account than years and years of labor. Honestly, now, what have you to show for that little 3 1/2 cents per acre per day that might just as well be buying you a beautiful 10-

acre farm? Where else could you put aside a few odd dollars so safely, so securely, and with such surety of seeing your modest savings fund develop into a great big investment?

No use trying to make yourself believe that savings bank interest will ever make you independent, nor 6% loans make you rich. Your money isn't working when you tie it up in such ways—it's LOAFING. Make your money work for YOU; right here in these rich fruit lands is your opportunity—here where a few dollars put to work NOW will reap all the benefit of development work constantly being done by the fast increasing population.

If you do not wish to improve your farm, you can in a few years, cash in on it from the investment standpoint without a stroke of work on your part. Think of it—two or three clears a day, or the cost of a few car fares laid by—and a magnificent grape fruit and orange grove is the result almost before you know it!

You can pay for your land by work. We will sell you ten or more acres and make a contract with you giving you employment clearing land. We will give you enough work to entirely pay for any number of acres you want. All you need is a willingness to work and enough money to pay your fare to Tampa. As clearing is hard work, we can only make such contracts with those who are physically able to do this kind of work. If interested in this special employment agreement be sure to write for information when sending the coupon.

Think of it—a 10-acre farm suburban to a city like this—a farm big enough to keep you in comfort all your lives, yet one you can pay for at the rate of just 3 1/2 cents per acre per day!

Get the facts now. The coupon brings them to you without cost or obligation. Get your 1915 opportunity clearly before you while prices on this newly opened tract are still low and terms easy. Today \$1.00 per acre per month buys you independence and a future. Tomorrow—who can say?

Tear off the coupon and mail it now and we will lay before you, by return mail, full and complete information showing how you can easily become the owner of one of these beautiful grape fruit and orange groves, and why it is sure to prove the shrewdest, most profitable investment you can possibly make.

North Tampa Land Co.

C. E. THOMAS, President
837 Marquette Building CHICAGO

North Tampa Land Co., Pop. Mech. 2-15
837 Marquette Building, Chicago

Please send me, FREE, assortment blank for 100 grape fruit and orange trees, and your latest Illustrated Book on choice Citrus Fruit and Truck Farms suburban to Tampa, Florida.

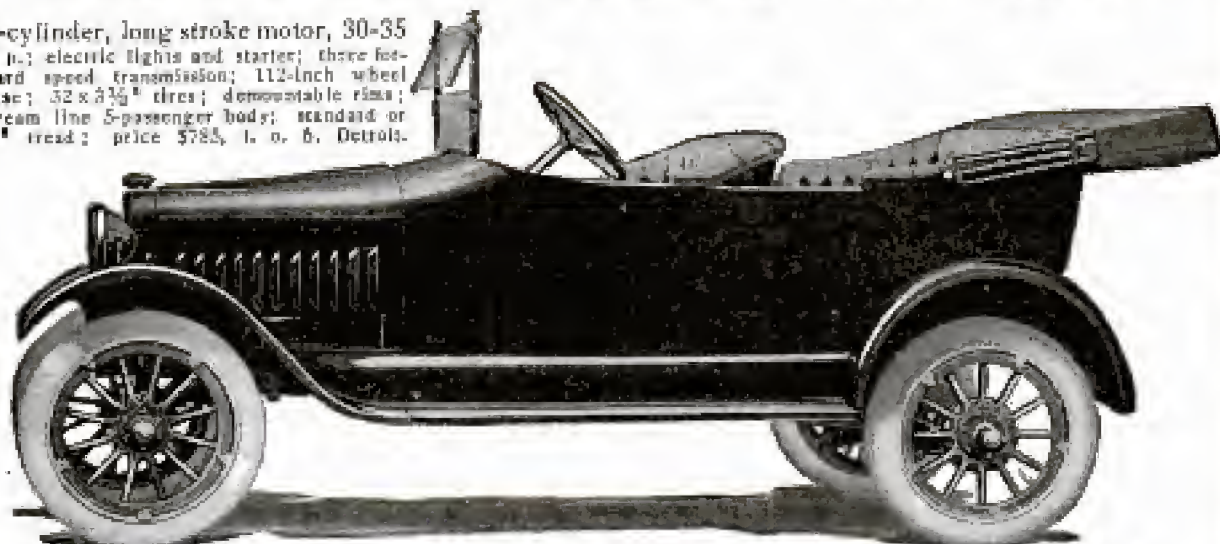
Name.....

Street No.....

City..... State.....

SAXON "SIX" \$785

Six-cylinder, long stroke motor, 30-35 h. p.; electric lights and starter; three forward speed transmission; 112-inch wheel base; 32 x 3 1/2" tires; demountable rims; stream line 5-passenger body; standard or 60" tread; price \$785, I. O. B. Detroit.



Now a "Six" You Can Afford

Here is positively the most compelling *touring car value* ever offered. That is our claim. We make it unreservedly. And we back it up with these reasons:

The Saxon "Six" is the first "Six" at a price as low as \$785. It answers a question the whole nation has been asking: "Why doesn't someone build a good low-priced six-cylinder car?"

This "Six" is in no sense a small car. It is not to be compared with small cars. It has a long wheelbase — 112 in.; plenty of leg room; plenty of width; seating comfort for five adults. In size — in all-around specifications — it compares with cars selling around \$1250 and above.

Nor is this car "just another automobile." It is a Saxon — stylish, individual. In its distinction of appearance, construction and performance it has been a surprise to every person who has seen it.

Remember, too, the Saxon "Six" is a *fully equipped car*. There is no extra charge for electric starter and lights, or speedometer, or any one of a number of other desirable conveniences. All these are a part of the car — at the price of \$785.

Doubled Output of the 2-Passenger Saxon, \$395

Last year the Saxon Company shipped more cars than any other company ever shipped in its first year.

Therefore, because the two-passenger Saxon has found its market; has made good at it; has proved its rock-bottom economy; has stood the "gaff," and has broken all known records for shipments — production of this popular roadster will be doubled for 1915.

Electric lights and starter (\$70 extra), auxiliary seat (\$10) to accommodate a third passenger, and other features now make the two-passenger Saxon at \$395 even more appealing than before.

WRITE FOR "SAXON DAYS"

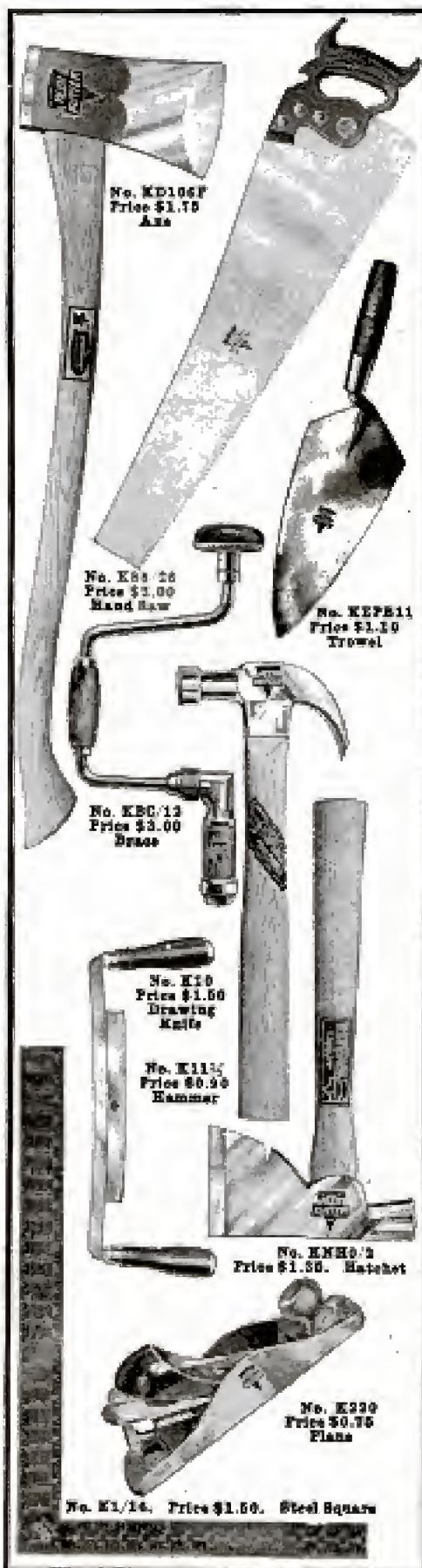
Send today for our interesting magazine, "Saxon Days." It gives details of Saxon cars and facts of interest to every owner or prospective owner of an automobile.



Two-passenger Saxon, \$395. With electric lights and starter, \$70 extra

Address Dept. J

Saxon Motor Company, Detroit



The Only Complete Line of Tools and Cutlery Under One Name

Maybe you buy one kind of hammer, another kind of saw, another make of draw knife. You take a chance on them all. You can't tell that those ordinary tools will prove out by test. Here is the only complete line of bench tools, kitchen tools, garden tools, farming tools and cutlery sold and guaranteed for quality under one name and trade mark.

KEEN KUTTER Tools and Cutlery

are guaranteed to make good or the dealer is authorized to take back any piece bearing the Keen Kutter trade mark that doesn't prove satisfactory. You only have to look for satisfaction in one place and from one maker. But you won't have to look for refunds when you use Keen Kutter tools. You *will* get satisfaction and your full money's worth.

Proof of worth is in the using of Keen Kutter goods of any name, of any description. Quality of materials and of workmanship is the watchword in producing Keen Kutter tools and cutlery.

Send for our Home Furniture Design
Booklet No. D-976.

*"The Recollection of Quality Remains,
Long After the Price is Forgotten"*
Trade Mark Registered. —E. C. SIMMONS.

If not at your dealer's, write us.

Simmons Hardware Company

St. Louis New York Philadelphia
Toledo Minneapolis Sioux City Wichita



Please Mention Popular Mechanics



Safety on Fast Turns

The motorcyclist takes the turns with confidence when Firestone Non-Skid Tires are gripping the road.

Then on the straightaway, he opens the throttle and "burns up the road" without thought of his tires.

The heavy pure rubber tread with the extra thickness of the raised letter stake the wear, and insulate fabric and inner tube from the heat.

Firestone

Motorcycle Tires

are built with Firestone accuracy to meet every tire requirement of the motorcycle.

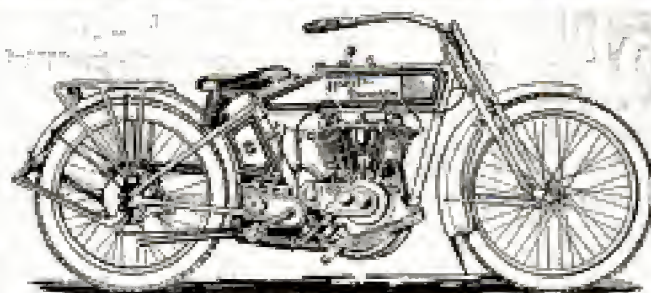
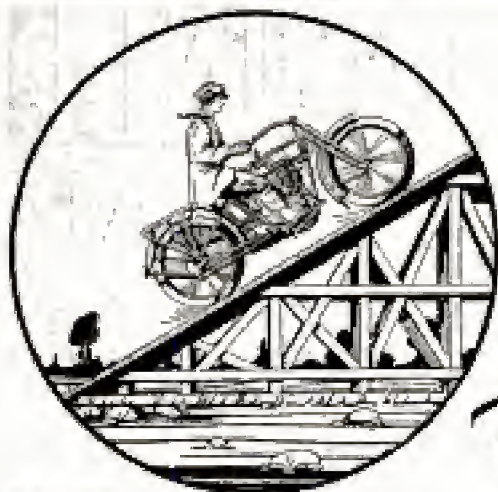
High speed and the varying angle of the wheels from the perpendicular are provided for in their design.

Firestone reputation for quality, won by actual performance on motor cars, has already extended to Firestone Tires for motorcycles by proving that they give—"Most Miles per Dollar."

Firestone Tire and Rubber Company

"America's Largest Exclusive Tire and Rim Makers"

Akron, Ohio—Branches and Dealers Everywhere



The 1915 Harley-Davidson Three Speed Twin Will Climb a 60% Grade.

THIS powerful machine has taken a Harley-Davidson and sidecar up a 45 per cent grade without a murmur, a grade nearly twice that of the steepest hill to be found in most localities.

The 1915 Harley-Davidson twin motor is guaranteed to develop eleven actual horse power ($37\frac{1}{2}\%$ more than the 1914 Harley-Davidson twin). This exceptional power in conjunction with the new Harley-Davidson three speed gives the rider more power than he really needs. If the going is rough, sandy, snowy or muddy, he can shift into intermediate gear and run mile after mile without overheating the motor.

These three-speed gears are cut so perfectly that they do not make a

sound. The rider will find the Harley-Davidson transmission as silent in low or intermediate gear as in high gear. It is possible to shift from intermediate to high gear or to slam into low gear, any time, anywhere, without fear of clashing or stripping of gears. This is positively prevented by an ingenious device.

There are many other features which add to the comfort, durability and economy of the 1915 Harley-Davidson, fully described in our catalog which will be sent upon request.

More Dealers for 1915

Additions to the Harley-Davidson factories enable us to add more dealers for 1915. If, as a dealer, you are situated in a locality where we are not represented and feel qualified to represent the Harley-Davidson in keeping with the Harley-Davidson name and reputation, get in touch with us at once.

Harley-Davidson Motor Company

Producers of High Grade Motorcycles for Nearly Fourteen Years
407-B Street MILWAUKEE, WIS., U. S. A.

YOU CAN BE AN ELECTRICAL ENGINEER AT A GOOD SALARY

Earn \$150.00 to \$250.00 a Month
WRITE TODAY! NO EXPERIENCE NECESSARY to enter this wonderfully fascinating, high-salaried work. You should **EARN BIG MONEY IMMEDIATELY**—on completing our Electrical Courses.

The great engineering companies are always searching for practical, trained electrical engineers. Excellent positions open all the time. Decide to fit yourself for one of these well-paid jobs.

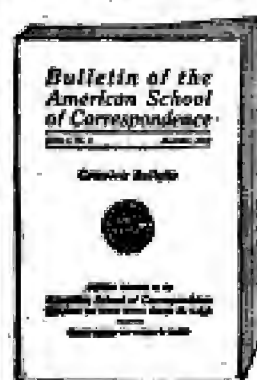
Electricity Offers Great Opportunities

Besides the high salaries paid to electrical engineers—the big profits you can make by starting an electrical business of your own—great fortunes are to be made through electrical inventions in the future.

The American School will train you to be an electrical worker or expert in a short time at small expense. You can start right in now and prepare yourself for a better position and more pay.

Earn While Learning

No need to give up your present occupation. Just devote your



spare time during the day or evening to this interesting work. It is no task to learn Electricity. As you read through the pages of our courses, you will find yourself simply "wrapped up" in the work. And you can draw your present salary while you learn—by means of this home study course.

The only expense will be the nominal charge for our complete tuition.

Pay as You Wish! Don't hold back because of the money. We will arrange for you to pay as best suits your needs.

GUARANTEE:

The world-wide reputation of the American School of Correspondence for integrity and efficiency, together with its thousands of successful graduates, gives you an unqualified guarantee of Success.

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Without any obligations on me whatsoever, please send me your bulletin and complete information regarding courses checked below.

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Our School Bulletin gives complete information concerning our courses and explains how YOU can become an expert Electrical Engineer.

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American School
 of Correspondence, Chicago, U.S.A.

In spite of WARS and Higher Tariff BASCH continues their *Import Price* for

Genuine Perfect Cut DIAMONDS

\$97.50
Per Carat

And Here's the Reason: We import *direct*, saving you the waste of needless middlemen; vast sales permit us to add only the smallest profit; and while WAR has stopped all importations and closed down the cutting works at Antwerp and Amsterdam, our million dollar stock enables us to continue our old before-the-war import price, **\$97.50 per carat!**

OUR **REAL** MONEY BACK GUARANTEE

Contracts to refund to you the full price IN CASH less 10% if for any reason you want to cash-in your diamond anytime within 1 year; allows full price in EXCHANGE, anytime! Certifies legally, carat weight, quality and value, so you know what you get for the money you invest! Stands alone as the only protecting Guarantee in the whole diamond business.

CAUTION: Always buy by Carat Weight

when you buy diamonds. Jewelers buy by carat weight; if they try to sell by the piece, its because their price per carat is higher by comparison. We've stood nearly alone for carat weight pricing for 36 years!

"Heart's Desire" by American's greatest Artist, Venzon Stanislaus. Shows the most beautiful type of American girl; paints her desire for love and a Diamond. See below.

SEND NO MONEY! No References. No Deposit!

Simply tell us what diamond and mounting you prefer; we ship it at our expense; permit fullest examination; all without obligating you to buy. This Basch Plan, 36 year-tested enables you to see before paying even one cent!

Never a Time Like NOW to

Buy DIAMONDS

Diamond prices going up every day; importations and cutting in Europe entirely stopped by the War. Here is a life-time opportunity for investment at before-the-war import prices guaranteed only while our stock lasts. You must write at once! Do not delay.



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1/2-carat Dia...\$8.25
14K Mounting... 3.75
Price Compl. \$12.00

14D122
1/2-carat Dia...\$17.50
14K Mounting... 3.75
Price Compl. \$21.25

14D123
3/4-carat Dia...\$31.25
14K Mounting... 3.75
Price Compl. \$35.00

14D124
3/4-carat Dia...\$67.50
14K Mounting... 3.75
Price Compl. \$71.25

14D125
1-carat Dia...\$31.25
14K Mounting... 5.50
Price Compl. \$36.75

14D126
1-carat Dia...\$45.00
14K Mounting... 7.00
Price Compl. \$52.00

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10K Solid Gold Cuff
links 2 Dia. pr. \$1.75

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14K Ear screws, two
1/2-carat dia. \$38.00

14D129 10K Solid gold Tin
clasp, 1 Dia. \$4 value...\$1.00

14D130 14K Solid
1-carat Dia. value...\$99.75

Watch may be worn with bracelet as complete wrist watch; or on chain, or with chain Gold or Silver

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10K Solid Gold WATCH; full jeweled, Hampden movement, extensile bracelet and chain, in gift case. Engraving free. Complete \$15.88



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N.B. If you will send us 4 cents in stamps to pay packing and postage, we will mail you a generous trial size of Colgate's Ribbon Dental Cream and our interesting booklet, "Dental Hygiene." If there are children in the family we will include—on request—"The Jungle Pow-Wow," a funny animal rhyme with colored illustrations.

The
daily use
of



helps to
Good Teeth-Good Health

Your health cannot be at its best without good digestion—nor can your digestion be at its best without good teeth. Clean Teeth is a matter of common sense.

Here is the way to care for your teeth:

When you get up in the morning and just before going to bed at night, brush your teeth with lukewarm water and Ribbon Dental Cream. Your dentist can tell you that this pleasant tasting dentifrice will make your teeth clean and leave your mouth cool and sweet.

Do not brush the teeth straight across. The outside of the upper teeth should be brushed downward from the gums; the lower teeth upward. Clean the inside of your teeth—next to your tongue—in the same way. The part of the teeth used for chewing food (the grinding surfaces) should be brushed in all directions.

After each meal use dental floss or a soft quill tooth-pick to remove bits of food which have become lodged in the crevices between the teeth.

Decay causes the teeth to ache, so by preventing decay you prevent pain. The best way to stop decay is to keep your teeth clean.

Go to the dentist at least once every six months. Have him remove stains, and fill cavities so that decay can no longer continue. The dentist's work will not hurt you so much if you go to him twice a year—and with teeth which you have regularly kept clean.

COLGATE & COMPANY, Dept. 81, 199 Fulton St., New York
Makers of Cashmere Bouquet Toilet Soap—luxurious, lasting, refined.

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